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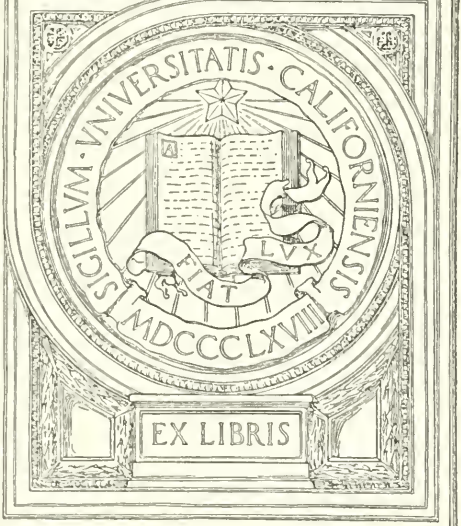

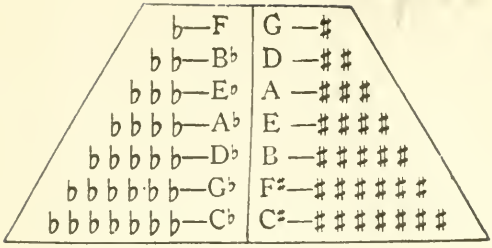
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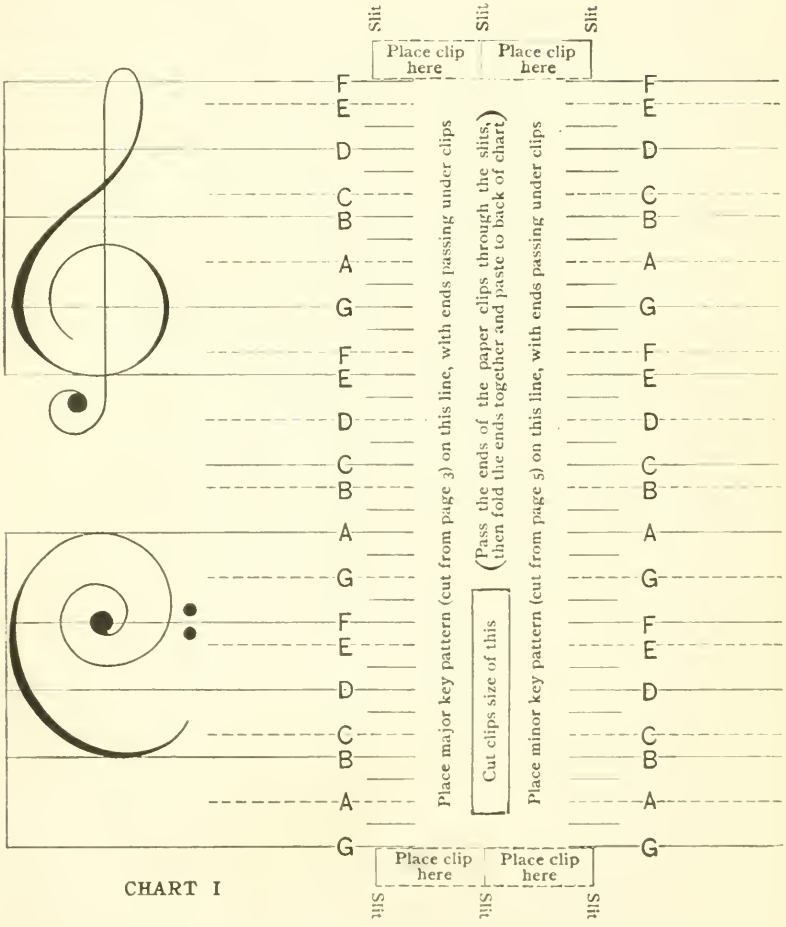
♭♭—B♭
♭♭♭—E♭
♭♭♭♭—A♭
♭♭♭♭♭—D♭
♭♭♭♭♭♭—G♭
♭♭♭♭♭♭♭—C♭
G —♯
D —♯♯
A —♯♯♯
E —♯♯♯♯
B —♯♯♯♯♯
F♯—♯♯♯♯♯♯
C♯—♯♯♯♯♯♯♯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Slit
Slit
Place clip here
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F
E
D
C
B
A
G
F
E
D
C
B
A
G
Place major key pattern (cut from page 3) on this line, with ends passing under clips
(Pass the ends of the paper clips through the slits, then fold the ends together and paste to back of chart)
Cut clips size of this
Place minor key pattern (cut from page 5) on this line, with ends passing under clips
Place clip here
Place clip here
Slit
Slit
Slit

CHART I

Major Key Pattern
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do

Major Key Pattern
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do

Major Key Pattern
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do

Major Key Pattern
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do

Major Key Pattern
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do

Major Key Pattern
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do

Major Key Pattern
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do
7 Ti
6 La
5 Sol
4 Fa
3 Mi
2 Re
1 Do

(Cut out on dotted lines)

1—La
7—Si
6—Fa
5—Mi
4—Re
3—Do
2—Ti
1—La
7—Si
6—Fa
5—Mi
4—Re
3—Do
2—Ti
1—La
Minor Key Pattern
(Page 5)
(Cut out on dotted lines)

MUSICOLOGY

A TEXT-BOOK FOR SCHOOLS AND FOR
GENERAL USE

By

MAURICE S. LOGAN

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PREFACE

The object of this work is to furnish a practical and comprehensive text-book on the theory and philosophy of music, for schools and for general use. It deals with the science rather than the art, while most music text-books deal with the art rather than the science.

For school use it is intended to be included in the science course, rather than in the music course. From the educational standpoint, either of mental training or useful knowledge, the science of music, as distinct from the art, is entitled to rank with the other sciences taught.

M. S. L.

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PART FIRST

ELEMENTARY

COMMON TERMS AND SIGNS USED IN MUSIC

1. **Notes** are characters used in music to represent tones. As to relative time value, there are six kinds of notes in common use: the whole note (𝅝), the half note (𝅗𝅥), the quarter note (♩), the eighth note (♪), the sixteenth note (𝅘𝅥𝅯), and the thirty-second note (𝅘𝅥𝅰): each being half the time value of the preceding one. The stems may extend either up or down; and the hooks, either right or left. Two or more notes are frequently attached to one stem. When necessary, the direction of the stem is made to show the part to which the note belongs. When a note has two stems in opposite directions, it belongs to two parts.

2. **Rests** are characters to represent silence. There are six rests, corresponding in time value to the six notes: the whole rest (𝄻), the half rest (𝄼), the quarter rest (𝄽, 𝄾, or 𝄿), the eighth rest (𝄾), the sixteenth rest (𝄿), and the thirty-second rest (𝅀).

3. A **dot** after a note or rest increases its time value one-half; thus a 𝅗𝅥. is equal to ♩♩♩, a ♩. is equal to ♪♪♪, and a ♪. is equal to 𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯 — and similarly as to rests.

4. A **Staff** consists of five lines with its four intervening spaces, on which the notes are written. It is a kind of musi-

cal ladder to indicate the pitch of tones. When necessary, short lines are added above or below. Each line or space of the staff is called a **Degree.**

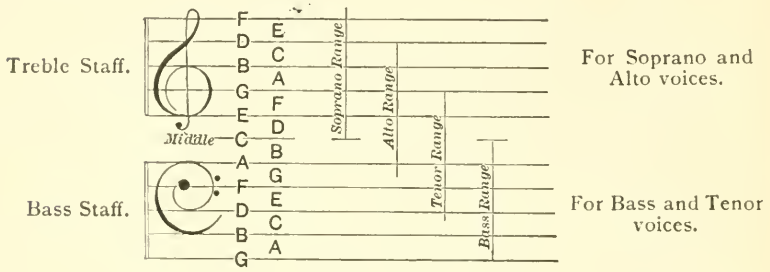


FIG. 1.

(Base in music is usually spelled *bass*; but *base* is more in accord with its meaning, as it means the base or foundation.)

5. In music the treble and bass staffs are usually separated so that words of a song may be written between, but it must be remembered that their relation to each other (as shown in Fig. 1) is not changed. Therefore, when thus separated, the second added line above the bass staff is the same as the lower line of the treble staff, and the second added line below the treble staff is the same as the upper line of the bass staff.

6. Sometimes (in choir or other music) each voice, or part, is written on a separate staff.

7. The 𝄞 clef is always placed on G, above middle C (encircling the line marked G), and is therefore called the G clef (or Treble clef). When this clef is used, middle C is always on the first added line below the staff.

8. The 𝄢 clef is always placed on F, below middle C (starting on and encircling the line marked F), and is therefore called the F clef (or Bass clef). When this clef is used, middle C is always on the first added line above the staff. It will

be seen in Fig. 1 that middle C is exactly midway between the G and F clefs.

9. The clef, when used, is placed on middle C (centering on the line or space marked C), and is therefore called the C clef (or Tenor clef when used for the tenor; or Alto clef when used for the alto). The C clef ( ) is a movable clef, and may be used to locate middle C on any degree of the staff by centering it on the desired line or space. It must be fixed in the mind that middle C is the same tone wherever written. It is called middle C because it is the middle of the great vocal compass, and is therefore the center around which the different voices range: female voices ranging mostly above; and male voices, mostly below. (See the average range of the different voices in Fig. 1.)

10. The clefs are used for the purpose of adjusting the staff to the range of voices that are intended to sing from it. It will be seen from Fig. 1 that the G ( ) clef, by locating G on the second line, adjusts the staff to the range of soprano voices; and that the F ( ) clef, by locating F on the fourth line, adjusts the staff to the range of bass voices. But we see that the alto and tenor (especially the tenor) ranges extend over onto both staffs thus adjusted: the alto notes (written on the treble staff) would require added lines below the staff, or the tenor notes (written on the bass staff) would require added lines above the staff (supposing the staffs separated as we find them in music). For this reason the C ( ) clef is sometimes used to adjust the staff to the alto or the tenor (especially the tenor) range by locating middle C (which is near the middle of both ranges) on any desired degree of the staff (usually on the third space or fourth line for tenor or on the third line for alto).

11. The tenor staff (middle C on third space) and the

treble staff (upper C on third space) are both lettered alike and therefore read alike. For this reason the treble or G clef is sometimes used for writing the tenor; but the tenor is thus written an octave higher than sung.

12. A staff consists merely of five lines (and the spaces between); its range being determined by the clef placed upon it. Observe that the staff is adjusted to the clef, and not the clef to the staff; for each clef represents a fixed tone.

13. As the C clef represents middle C, its natural position is exactly midway between the G and F clefs.

14. When the music for the different voices or instruments is written on separate staffs, it is called *score* music, and two or more staffs connected by a brace is called a **Score.**

15. In most song-books, however, we find the soprano and alto written together on the treble staff, and the bass and tenor together on the bass staff. In which case the soprano is represented by the upper notes on the treble staff, and the alto by the lower notes on the treble staff; the tenor is represented by the upper notes on the bass staff, and the bass by the lower notes on the bass staff.

16. The tune, or melody, is usually in the soprano—the other parts being an accompaniment.

17. Female voices range one octave (eight degrees) higher than male voices—female voices being limited to the soprano and alto ranges, and male voices to the bass and tenor ranges—so that men in singing the soprano or alto from the treble staff sing an octave lower than written, and women in singing the bass or tenor from the bass staff sing an octave higher than written. This, however, occasions no inconvenience, as singing in octaves produces the same musical effect; for which reason, tones an octave apart are lettered alike.

18. The bass and treble staffs (shown in Fig. 1) are fixed as regards their tone range, so that each line and each space represents a certain pitch of tone, each of which is named by one of the seven letters, A, B, C, D, E, F, G; these seven

letters being repeated in each octave. (From any letter to the same letter above or below is an octave.)

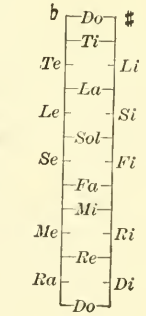
19. The names usually applied to the relative tones of a key (see p. 31 : 1) are the seven syllables *Do*, *Re*, *Mi*, *Fa*, *Sol*, *La*, *Ti*, which are repeated in each octave. These syllables are a great assistance in reading music, and aid in producing good tones. They are of Italian origin, and must be given the Italian pronunciation by giving *i* the sound of *ē*, *e* the sound of *ā*, *a* the sound of *ä* in "far," and *o* the sound of *ō* in "no." For the sake of uniformity in the different countries, the Italian language is recognized as the language of music.

20. A **Sharp** (♯) placed on a line or space raises its pitch a half-step. A **Flat** (♭) placed on a line or space lowers its pitch a half-step. A **Natural** (♮) destroys the effect of a sharp or a flat.

21. The sharps or flats at the beginning of a piece of music is called the **Signature.** They are placed on the lines and spaces that are to be sharped or flatted throughout the piece. They also affect the same letters in each octave.

22. Sharps, flats, and naturals are called **Accidentals** when they occur during the course of the music. An accidental influences the line or space on which it is placed only to the end of the measure, unless the affected note is tied over into the next measure.

23. In reading music thus affected by accidentals, to give a sharp effect to any key syllable use the sound of *i* (pronounced *ē*); thus changing Do to *Di*, Re to *Ri*, Fa to *Fi*, Sol to *Si*, and La to *Li*. To give a flat effect to any key syllable use the sound of *e* (pronounced *ā*)—in Re use the sound of *a* (pronounced *ä*)—thus changing Ti to *Te*, La to *Le*, Solt o *Se*, Mi to *Me*, and Re to *Ra*.



Give Italian pronunciation.

FIG. 2.

RHYTHM

1. **Accent** is a stress of the voice on certain pulsations of the music.

2. Music has regularly recurring accents which cause it to throb or pulsate. This throb or pulsation is called the **Rhythm** of the music.

3. A light bar is drawn across the staff before each heavy accent, thus dividing the music into equal parts called **Measures.** Measures therefore indicate the rhythm of the music.

4. Heavy bars across the staff are frequently used to mark the end of a line of words. A double bar across the end of the staff marks the close of the music or of a strain.

5. **Time.** Time refers to the number and time value of the pulses in each measure, by which the time value as well as the rhythmic nature of each measure is shown.

6. The time value to be given to each measure is shown by the figures at the beginning of the music, called the *Fraction;* the upper figure showing the number of pulses in each measure, and the lower figure showing the time value of each pulse. ($\frac{4}{4}$ time is sometimes marked thus, $\mathbf{C}$; $\frac{2}{2}$ time thus, $\mathbf{C}$; and $\frac{3}{2}$ time thus, $\mathbf{C}\,\mathbf{C}$ or $\mathbf{C}\,\mathfrak{D}$.) The lower figure of the fraction is usually 2, 4, or 8, according as each pulse is to be valued at a half, quarter, or eighth note. The upper figure is usually 2, 3, 4, 6, 9, or 12. If the upper figure is divisible by 2, it is called duple or even time (or rhythm); if divisible by 3, it is called triple or uneven time (or rhythm).

7. In duple time every other pulse is accented. In triple time every third pulse is accented. 6 and 12 naturally divide into groups of 3's by accents on every third pulse, and are therefore triple as to the groups, though even as to number of groups, in a measure. 9 is triple, both as to groups and number of groups.

8. The heavy accent in each measure is always on the first note of the measure; the other accents (if any) in each measure are lighter accents. As every second or third pulse is ac-

cented, therefore, if a measure contains four or more pulses, it must contain one or more light accents; and the pulses will be divided by means of the accents into groups of 2's or 3's, according as the time is duple or triple.

9. Sometimes the upper figure of the fraction is 5 or 7. These are called peculiar rhythms, being neither duple nor triple, but may divide into alternate groups of 2's and 3's, and therefore alternately duple and triple as to the groups.

10. Two dissimilar rhythms are sometimes used at the same time (but in different parts) and called combined rhythm.

11. The usual method of keeping time in singing is by beating time with the hand. The usual manner of beating time is—down, up; down, left, up; or down, left, right, up —according as there are 2, 3, or 4 pulses to the measure, including one pulse to each beat. If there are 6, 9, or 12 pulses in a measure (divided into groups of 3's), the time is beat in the same manner by including three pulses to each beat.

12. If one pulse is included in each beat, the time is called *Simple.* If three pulses are included in each beat, the time is called *Compound.* As regards the number of beats in a measure, the time is commonly called double, triple, or quadruple (if simple); or, compound double, triple, or quadruple (if compound). In compound time, only the accents are beat.

13. The manner of beating time is not essential—evenness being the essential feature. Beating time is not difficult if the rhythm or throb of the music is felt: feeling the rhythm is beating time mentally. A common method of keeping time when playing is counting the pulses in each measure.

14. **Broken Pulses.** If the time value of a pulse is broken in any manner, it is called a *broken pulse.* The time value of a pulse may be broken up into any kind of notes, or notes and rests, which together equal the time value of the pulse. On the other hand, a single note may cover the time value of one

pulse and part of another or two or more pulses. Thus there is no fixed relation between the time values of the pulses and the notes. If their time values corresponded each to each, keeping time in music would be a very simple matter. This is the case in some very simple pieces of music. The difficulty in keeping time correctly naturally increases as the relation between the time values of the pulses and the notes becomes more and more complex.

15. Beating time serves to mark the time value of the pulses (singly, in simple time; by 3's or by accents, in compound time), so that the real art of keeping time consists in giving the proper relative time values to the different parts of the broken pulses. This involves a development of the sense of relative time. This sense is naturally stronger in some persons than in others, but it is usually more or less a matter of development.

16. **Tätäing** is a method which has been found useful in developing the sense of relative time. It consists in giving time names to the pulse and its various divisions, which must become associated with time just as the key syllables are associated with pitch.

17. The following is a diagram of a system of Tataing:

	a	b	c	d	e	f	g
1	$\frac{1}{2}$ $\frac{1}{2}$	$\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$	$\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$	$\frac{1}{2}$ $\frac{1}{4}$ $\frac{1}{4}$	$\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{2}$	$\frac{3}{4}$ $\frac{1}{4}$	$\frac{1}{4}$ $\frac{3}{4}$
Tä	tä-tä	tä - tä - tē	tä-fä-tē-fē	tä - tē - fē	tä - fä - tä	tä‿ē - fē	tä - fä‿ä

(Pronounce vowels as marked.)

Fig. 3.

18. *Tä* is the name of the whole pulse regardless of the time value of the pulse note. If it extends over one pulse, the vowel is repeated (Tä-ä) for each pulse over which it extends. The sections *a*, *b*, *c*, *d*, *e*, *f*, *g* represent broken pulses—each broken as indicated by the fractions. The value of the notes corresponding to these fractions depends, of

course, on the value of the pulse note. The fractions ¾ represent dotted notes.

19. Observe that *d* is made up of the first half of *a* and the last half of *c*; *e* is made up of the first half of *c* and the last half of *a*; *f* is the same as *d* except that the consonant part of the middle syllable is dropped, since the first two syllables belong to the same note. Similarly *g* is the same as *e* except that the consonant part of the last syllable is dropped.

20. All of these combinations are equal in time value and must be pronounced in the same time, as each represents the time value of one pulse. Changing the value of the pulse merely changes the rate of movement throughout the music.

21. Only the time values (not the pitch) of the notes of the music are considered while tataing.

22. **Counting Time** consists in counting the pulses in each measure. Whole pulses may be counted thus, 1, 2, etc.; half pulses thus, 1 and 2 and etc.; triplets thus, 1 and a 2 and a etc.; quarter pulses thus, 1 a and a 2 a and a etc. (the words borrowing their time from the counts). The shortest note in the music usually determines the manner of counting, and the music is then counted through (from beginning to end) accordingly.

23. **Measures.** The common method of reckoning the measures in music is from measure bar to measure bar, and when the music begins and ends with an incomplete measure, the two ends count together as one measure; but, evidently, the two ends cannot belong to the same measure.

24. It is, perhaps, more correct to reckon the measures from like phase to like phase of the rhythm, beginning with the first note of the music. (If we measured music as we measure anything else, we would begin at one end and apply the measure.) There are thus no incomplete measures at the beginning and the end of the music, for the music always begins and ends at the same phase of the rhythm. The measure

bar is used primarily for the purpose of indicating the principal recurring accent, and may be in the middle or any other part of the measure, depending on the phase with which the music begins. However, the common method is more convenient, as it appeals directly to the eye, and for this reason is generally adopted.

25. In dividing the music into measures, the composer would naturally (by singing or feeling the music) decide whether some accents were stronger than others, and thus determine the principal recurring accent and place a bar before each note upon which it fell. He thus divides the music visibly into sections which may be called measures. He then determines the number of pulses and the location of the lesser accents, if any, in each section; and he also decides the time value of the pulse note to correspond to the value of the written note or notes sung to each pulse. The result is expressed in the form of a fraction and put at the beginning of the music—it being understood that every second or third pulse (according as the rhythm is even or uneven) is accented strong or weak.

26. Determining which are principal and which secondary accents is largely a matter of judgment. In march and in dance music the rhythm is so pronounced that there is no difficulty in determining the character of the accents; but in some other music the distinction between the principal and the secondary accents is so slight that there is room for a difference of judgment, and different persons would divide the music differently. Thus, whether a piece of music is written in $\frac{2}{4}$ or $\frac{4}{4}$ time, or in $\frac{3}{8}$ or $\frac{6}{8}$ time (as the case may be), depends on whether every or every other accent is regarded as the principal recurring accent. But, as a rule, the whole matter is left to the judgment of the composer.

27. Singing very slow tends to develop accents not otherwise observed, and at the same time the ear tends to divide each pulse into two, thus changing $\frac{3}{2}$ into $\frac{4}{4}$ time, etc. Singing very fast has the reverse effect.

28. **Tempo or Rate of Movement.** The time values as indicated by the shapes of the notes are only relative (not absolute). The same tune may be sung as slow or as fast as the singer desires; but the rate of movement with which the music begins should be maintained throughout, except where the movement is purposely accelerated or retarded for a special effect. However, the time values given to the written notes are intended to indicate the rate of movement within reasonable limits; for, evidently, if the composer intended the music to be sung fast he would give shorter values to the notes than if he intended it to be sung slow. The actual time value of the pulse necessarily depends on the rate of movement, so that the rate of movement is also indicated within reasonable limits by the value given to the pulse note in the fraction at the beginning of the music.

29. It is desirable to have a standard of time value with which to compare. The standard time value given to the quarter-note is one second; therefore the quarter as a pulse note usually represents about one pulse per second, or 60 per minute, written M. 60. [The Metronome (M.) is an instrument for counting pulses.] If the music is intended to be sung nearer M. 120 than M. 60, the eighth-note would be taken as the pulse note and the music written accordingly. If the music is intended to be sung nearer M. 30 than M. 60, the half-note would be taken as the pulse note and the music written accordingly.

30. **Applying Words to Music.** In applying the words of a song to the music, one syllable is applied to each note unless two or more notes are tied together. Notes may be tied by having their hooks united, or by the tie (⁀) or slur (⁀). One syllable is usually applied to all the notes thus tied.

31. Poetry as well as music has regularly recurring accents, producing duple or triple rhythmical movement. Rhythm therefore is an essential part of both poetry and music. The

blending of poetry and music in songs is due largely to their common rhythmical nature.

32. The pulses of the music are all of the same length—being regulated by the value of the pulse note regardless of the written notes being of different lengths, some greater than one pulse and others less than one pulse.

33. The rhythm of the poetry is not thus restricted. But as one note is applied to each syllable, therefore the time value of each syllable depends on the value of the note applied to it; so that a syllable may cover more than one pulse of the music, or a pulse may cover more than one syllable. Therefore the duple or triple character of the rhythm of the music is not necessarily determined by the duple or triple character of the rhythm of the poetry; each rhythm restricting the other only to the extent of causing accented syllables to come on accented pulses and unaccented syllables on unaccented pulses.

34. **Interrupted Rhythms.** The regular rhythm of the music is often purposely interrupted for a short time in order to heighten by contrast the rhythmical sense of the music. There are three principal ways of doing this: first, by temporarily quickening or retarding the time—indicated by such words as *accelerando*, *ritardando*, etc.; second, by stopping the rhythm for a short time—indicated by a *pause* ($\frown$) over a note, which shows that it may be prolonged at pleasure, usually about double the regular time of the note (in beating time the hand should be held during the pause, as the rhythm stops); third, by temporarily displacing the regular accent—called **Syncopation.**

35. The principal ways of syncopating are:

1. Beginning a note on an unaccented part of a measure and extending it over the following accent, as at *a* (Fig. 4);
2. Reversing the accent by placing accent marks over the usually unaccented parts of a measure, as at *b*;

3. Writing rests on the accented parts of a measure and notes on the unaccented parts, as at *c*;
4. Tying unaccented notes to accented notes, as at *d*;
5. Writing notes between, instead of on, the usual pulses of a measure, as at *e*.

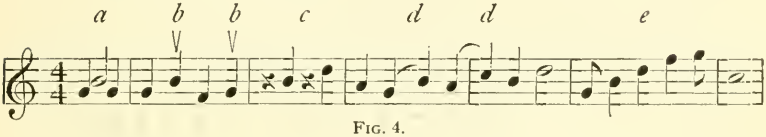


FIG. 4.

36. **Triplets.** A numeral placed above or below a group of notes affects their normal value. The most common instance is a 3 placed above or below a group of three notes, which indicates that they are to be sung or played in the time of two. The notes thus affected are called triplets. They do not, however, affect the rhythm of the music.

37. **Repeats.** *Dots* between the lines at the left of a bar mean *to repeat*, and *dots* at the right of a bar show *where a repeat begins*. *D. C.* (*Da Capo*) means *repeat from the beginning*. *D. S.* (*Dal Segno*) means *return to the sign* (S or 𝄋). The word *fine* means *the end of a repeat*.

EXPRESSION

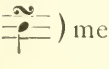
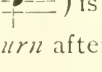
1. *Expression marks* affect the character of music as regards Power, Quality, and Movement, for the purpose of bringing out the sentiment.

2. **Terms relating to Power.** *Pianissimo* (*pp*), very soft; *Piano* (*p*), soft; *Mezzo* (*m*), medium; *Forte* (*f*), loud; *Fortissimo* (*ff*), very loud; *Crescendo* (<), increasing tone or tones; *Diminuendo* (>), diminishing tone or tones; *Swell* (<>), increasing and diminishing; *Forzando* (*fz*, or >), a sudden burst of tone; *Staccato* (,,,), short and distinct; *Semi-Staccato* (···), less short and distinct; *Legato* (opposite of *staccato*), smooth and connected—sometimes indicated by a slur (⁀) placed over the notes.

3. **Terms relating to Quality.** *Somber*, tones of reverence, sadness, or fear; *Clear*, tones of courage, joyfulness, or gayety; *Maestoso*, loud and majestic; *Affettuoso*, soft and sad; *Dolce*, soft and sweet; *Con Spirito*, with spirit; *Con Dolore*, with grief; *Giojoso*, joyfully.

4. **Terms relating to Movement** (or *tempo*). The chief of these from slowest to fastest are: *Grave*, *Largo*, *Larghetto*, *Adagio*, *Lento*, *Andante*, *Andantino*, *Moderato*, *Allegretto*, *Allegro*, *Presto*, *Prestissimo*.

5. For other musical terms see Musical Dictionary at back of book.

6. **Embellishments.** A *Turn* (∾) placed over a note () means that it is to be sung or played thus, , involving the notes above and below, beginning with the highest. An *Inverted Turn* (∾ or ƨ) includes same notes in an inverted order. A *turn* after a note ( ) or dotted note () is made by striking the note first and making the *turn* afterward. A sharp or flat above the *turn* affects the upper auxiliary note; but if below, it affects the lower auxiliary note.

7. A *Trill* (tr) placed over a note means a rapid alternation with the note above to the time value of the note. A *trill* usually ends with a *turn*, and may also begin with a *turn*. There are also trill chains (succession of trills), and double trills (two trills at the same time).

8. The *Mordant* (𝆆) is a short trill, involving usually but one beat.

9. These signs are used to abbreviate the writing of music:

10. A line drawn through any sign, thus, 𝆆, inverts it.

11. Any two signs combined give the combined effect of both; thus 𝆆, or 𝆆̃, is a *mordant* followed by a *turn*.

12. A *Grace Note* is a small note written before or after the note it is intended to embellish and from which it borrows its time.

13. The *Appoggiatura* (usually written as a grace note) is an embellishing note prefixed to an essential note on an accented pulse of a measure. When written as a grace note, it receives the accent and borrows half or more of the time value of the note, and is therefore made more prominent than the note to which it is prefixed. Its effect is languishing and sorrowful.

14. The *Acciaccatura* is a grace note a half-step above or below the note to which it is prefixed. It is very short and never accented. It takes as little of the time value of the note to which it is prefixed as possible (opposite of the *appoggiatura*). Its effect is crisp, bright, and joyous.

15. An *After Tone* is a grace note which follows an essential note.

KEYS

1. Music is divided into what are called **Keys**—tones having a sympathetic relation to each other. A *key* therefore is a family of related tones. Every key is made up of seven steps, or intervals, which are repeated in each octave.

2. See Chart I. at front of book. Place key patterns in position (see instructions on Chart).

3. The lines on the face of the Chart represent the lines of the music staff, and the dotted lines represent the spaces of the music staff. These are marked with the scale letters A, B, C, D, E, F, G, and are so spaced as to represent the natural tone steps, or *major key* intervals; these seven letters are repeated in each octave. Observe that there is a half-step between each E and F, and B and C, and whole steps between all the other letters. The short marks show the half-steps between the letters. Each short mark is the sharp (♯) of the letter below it or the flat (♭) of the letter above it.

4. Next observe that the movable key strip (marked

major) also has lines drawn across it, which are *also* spaced to represent the major key intervals, or tone steps, and are marked with the seven syllables Do, Re, Mi, Fa, Sol, La, Ti, and the seven numerals 1, 2, 3, 4, 5, 6, 7, which are repeated in each octave. Observe also that there is a half-step between each *Mi* and *Fa* (or 3 and 4), and each *Ti* and *Do* (or 7 and 1).

5. There is a natural sympathy existing between the tones thus related. Any group of tones thus related is called a *major key*. This major key strip may therefore be regarded as the pattern, or mode (meaning mode of arrangement), for all the major keys.

6. There is also a *minor key* pattern, or mode (see key strip marked *minor*). Observe that there is a half-step between each 2 and 3, 5 and 6, and 7 and 1, and an augmented interval (equal to one and one-half steps) between 6 and 7. Sol being sharped is changed to *si*, and the key-note (1) is on *La* instead of *Do*. It is formed by sharping 5 (Sol) of the major key pattern and changing the key-note to *La*. This is the pattern, or mode, for all *minor* keys.

7. The major and minor key patterns are placed side by side in Fig. 10 (p. 43) for comparison. The *major* mode is of major (greater) importance, and the *minor* mode is of minor (less) importance.

8. To adjust Chart I. to the key in which any piece of music is written, first count the sharps (♯'s) or flats (♭'s) at the beginning of the music (the signature), then find the same number in the key table at top of Chart: the letter opposite will be the key letter.

9. Now set the major key pattern so that the key-note 1 (Do) will be opposite the key letter. The syllables on the key pattern will match all the letters on the staff except the letters which are to be sharped (raised a half-tone) or flatted (lowered a half-tone). Observe also that the sharps or flats in the signature of any piece of music are on the same lines

and spaces that the key pattern (when set to the same key) shows are to be sharped or flatted.

10. Take a music book and test the signatures in all the different keys by Chart I., by setting the major key pattern to the desired key and comparing the signature with it.

11. When a piece of music has no signature it is in the key of C. Now set the key pattern so that 1 (Do) will be opposite C. It will be seen that all the letters and syllables match, so that none of the letters have to be sharped or flatted to conform to the key pattern. For this reason the key of C is also called the natural key.

12. It will also be noticed from the Chart, that when any letter is sharped or flatted it is affected the same way in each octave. Therefore the sharps or flats in any signature affect the same letters in each octave. It is customary to place the signature once on each staff.

13. Set the major key pattern to the keys of one, two, three, four, five, six, and seven sharps in succession (writing down the letters sharped in each case). Observe that each key is formed by adding one new sharp to those of the preceding key.

14. Examine the flat keys in the same way.

15. As each new key is formed, the last sharp or flat is placed in the signature on the line or space affected, a little in advance to the right of the others.

Fig. 5.

16. Fig. 5 shows the signatures of the key of seven sharps and the key of seven flats. These include all the other signatures, by taking them from left to right as they come.

17. The intermediate tones, between the fixed tones represented by the letters of the staff, are indicated on the Chart by the short marks between the letters. They are indicated in music by sharps and flats. They are indicated on the keyboard of the piano or organ by the black keys.

18. Fig. 6 shows the relation between the music staff and the piano or organ key-board. Observe that the letters on the staff match the white keys of the key-board, and the short marks between the letters match the black keys. Each black key is the *sharp* of the white key next below, or the *flat* of the white key next above. (When referring to the key-board, the word *key* refers to one of the white or black finger-bars; elsewhere the word *key* refers to a family of related tones.)

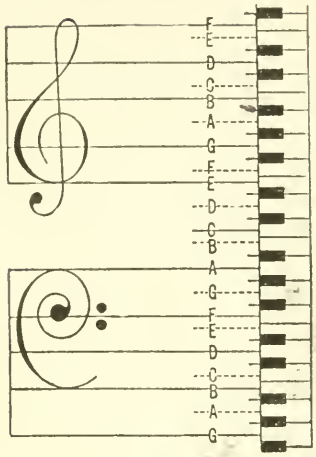


Fig. 6.

19. See Chart II. at back of book. Place key pattern in position (see instructions on Chart).

20. A general knowledge of music involves also a knowledge of the principles of the key-board. It is only necessary to remark here that all observations on Chart I. apply also to Chart II. in a similar manner.

21. As the signature of any piece of music shows what tones are to be sharped or flatted throughout the music, and as the black keys represent sharps or flats, therefore the signature of any piece of music shows what black keys are used in playing it. As there are only five black keys in each octave, therefore six or seven sharps or flats in the signature show that E and B or F and C are, one or both, sharped or flatted, as the case may be. But as there is no black key between E and F or B and C (they being only a half-step apart), one is used as the flat or sharp of the other.

22. A **Diatonic Scale** consists of the regular tones of a key in successive order, as shown by the major and minor key patterns.

23. A **Chromatic Scale** consists of both the regular and intermediate tones in successive order (see Fig. 2, p. 21).

24. Although in music the lines of the staff (and therefore the letters) are spaced equally, yet it must be fixed in the mind that there is always a half-step in tone between E and F, and between B and C, and a whole step between all the other letters as shown on the Charts; so that the key of C conforms to the pattern without any sharps or flats. In all other keys, the sharps or flats in the signature show what lines and spaces must be raised or lowered in tone to make the key conform to the pattern.

READING MUSIC

1. The first step is learning the letter names of all the lines and spaces of both the bass and treble staffs so that they can be named without hesitation. The second step is learning to run the scale with the voice, using the key syllables, *Do, Re, Mi, Fa, Sol, La, Ti, Do*: this will have to be learned from some musical instrument or the voice of a teacher.

2. Each of the key-tones, represented by the seven syllables, produces a certain mental effect. The character of the key-tones may be described as follows: *Do*, "the strong or firm tone"; *Re*, "the rousing or hopeful tone"; *Mi*, "the steady or calm tone"; *Fa*, "the desolate or awe-inspiring tone"; *Sol*, "the grand or bright tone"; *La*, "the sad or weeping tone"; *Ti*, "the piercing or sensitive tone." The mental effect of any tone is called its key-tonality and is due to its relation to the key-note.

3. After learning the key-tonality of each tone the key-note may be pitched with the voice to any key, and the other tones will adjust themselves to it by reason of their key-tonality. The key-tonality of each tone does not change; it is only the pitch that changes. This may be illustrated by shifting the key pattern (Chart I.) to bring Do opposite any letter: it is evident that the syllables all move together and that their relation to each other and to Do does not change.

4. A piece of music (being made up of key-tones) can be changed to any key just the same as the key pattern can be shifted to any key (being merely a change of pitch), but the music should be written in that key which will bring all the notes within the average range of the voice as shown by the staff.

5. Changing the key of a piece of music is called **Transposition.** We may transpose any piece of music to suit the voice, as the key is only a question of pitch.

6. There can be no intelligent understanding of music until this key-tonality, or sympathetic relation of the tones of any key, is understood; and this is most readily accomplished by the use of the key syllables.

7. The mental effect (key-tonality) of a tone is due to a sort of unconscious mental measurement of the interval, or distance, from the point of repose (key-note previously established in the mind), and its association with the tone or tones immediately preceding, the effect of which has not yet passed out of the mind. A tone entirely unassociated with other tones has no key-tonality by which its key can be recognized, as it may belong to different keys.

8. The ability to recognize the key-tonality of tones (and also rhythm) is so developed through practice as to enable one to mentally hear a piece of music by merely following the notes with the eye, as distinctly as if it were sung or played; and also to mentally see a piece of music (how it is written) by merely hearing it sung or played, and thus be able to write it.

9. The ability to thus hear with the eye is essential in order to read music readily, while the ability to see with the ear is essential in order to write music; both are the natural growth of practice, exactly as in reading and writing spoken language. We understand what we read without reading aloud, thus applying the principle of hearing with the eye. In writing what we hear spoken, we apply the principle of seeing with the ear.

10. **Beating Time** is indicating the pulses of the music with the hand.

11. **Tataing** the music is singing the time names (p. 24: 17, 18) of the notes on one tone. This is more especially for the purpose of fixing in the mind the relative time value of the parts of broken pulses, after which beating time is sufficient. Both exercises are intended to develop the faculty of feeling the rhythm of music.

12. **Solfaing** the music is singing the music with the key syllables.

13. **Laing** the music is singing the music with the open syllable *La*, the object of which is to overcome the dependence on the key syllables which solfaing tends to produce.

14. These are the usual stages of practice in learning to read music, before applying the words. Beating time and solfaing are the essential stages, the others are side helps.

THE TONIC SOLFA NOTATION

1. There are two principal methods of notating, or writing music, in use.

2. The *Staff Notation* consists in representing the music by notes on a staff, as already explained.

3. The *Tonic Solfa Notation* consists in representing the music by the first letters of the key syllables (instead of notes) written in a straight line. The first octave above the key-note (called the unmarked octave) is written thus—**d r m f s l t**; the octave above the unmarked octave, thus—**d' r' m' f' s' l' t'**; the octave below the unmarked octave, thus—**d_1 r_1 m_1 f_1 s_1 l_1 t_1**. The figure 2 may be placed above or below if a further extension is needed in either direction.

4. The time is indicated by punctuation marks between the letters. A bar (|) is placed before each principal accented pulse, thus dividing the music into measures. A short bar (ǀ) is placed before each lesser accented pulse, and a colon (:) before each unaccented pulse, thus dividing each measure into pulses. A period (.) divides a pulse into halves; a

comma (,) divides a half-pulse into quarters; a period and comma close together divide a pulse into three-quarters and one-quarter—the period being on the side of the greater part. Inverted commas divide a pulse into thirds. A macron (—) indicates a continuance of the preceding tone. Rests are indicated by vacant spaces. A horizontal bar (—) over or under two or more letters ties them together the same as a tie (⁀) or slur (⁀) in other music.

5. The time value of each pulse, or the rate of movement, is usually shown by a metronome mark, thus, M. 60 (or any other number), placed over the beginning of the music. The key is also shown by the key letter being placed over the beginning of the music. Also, whenever the key changes during the music (modulation, p. 90) the new key letter is placed over the point where the new key begins, and the *Bridge Tone* has its old name placed above its new name, thus, $\frac{s}{d}$, and takes its new name at its old pitch, and the following tones in the new key are pitched accordingly.

6. The following example is intended merely to illustrate each of the foregoing principles:

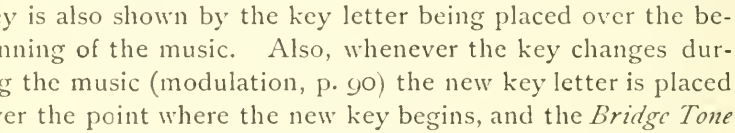


Fig. 7.

7. The small letter beside each new key letter above is the (♭ or ♯) tone which distinguishes the new key, and is placed before or after the key letter, according as it is ♭ or ♯.

INTERRELATIONSHIP OF MAJOR KEYS

1. To study the major keys, set the major key pattern (Chart I.) first to the key of C and notice that F is opposite the figure 4 on the pattern; now set the pattern to the key of one sharp and notice that F (which was the 4th of the old

key) is sharped and becomes the 7th of the new key. Now notice the 4th of this key and move to the key of two sharps, and we again find that the 4th of the old key (sharped) becomes the 7th of the new key. Continue this operation through all the sharp keys. Thus we find that all the *sharp* keys are formed by sharping the 4th letter of the preceding key, which then becomes the 7th of the new key. Observe also that the key-note (1) of each key is on 5 of the preceding key.

2. Study the *flat* keys by setting the pattern again to the key of C, and notice that B is opposite 7; now set the pattern to the key of one flat and notice that B (which was the 7th of the old key) is flatted and becomes the 4th of the new key. Now flat the 7th of this key, and move to the key of two flats (B♭—set 1 on the short mark below B); the letter that was flatted will now be the 4th of the new key. Continue through all the flat keys. Thus we find that the *flat* keys are formed by flatting the 7th of the old key, which becomes the 4th of the new key (reverse of sharp keys). Observe also that the key-note (1) of each key is on 4 of the preceding key.

3. The last sharp is always on the 7th of the key, and controls the half-step between 7 and 1. The last flat is always on the 4th of the key, and controls the half-step between 3 and 4.

4. Observe that the half-steps between each 3 and 4 and each 7 and 1 of the major key pattern divide it into alternate $2\frac{1}{2}$ and $3\frac{1}{2}$ step sections; and observe also that raising each 4 or lowering each 7 a half-step would, in either case, reverse the sections. This is exactly what happens to any key when we sharp the 4th or flat the 7th of the key. As the key pattern cannot be changed, it will have to be moved up or down till the sections correspond, thus forming a new key, since the key-note (1) which determines the key has been moved to a new position.

5. These observations on the interrelationship of major keys may be put into the form of a table, as shown in Fig. 8.

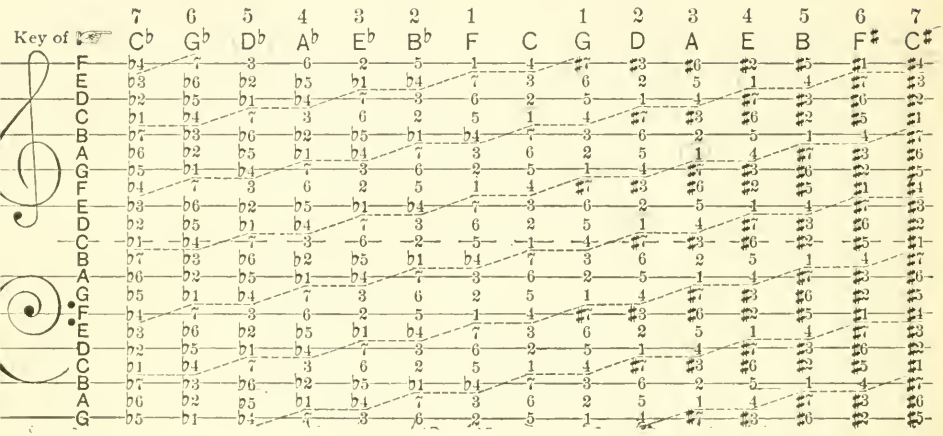


Fig. 8. Major Key Table.

6. In this table the figures in each key correspond to the figures on the key pattern and also represent the syllables (the syllables being omitted for the sake of simplicity). Observe that here the staff is spaced equally as in music, instead of as on Charts I. and II.; the sharps and flats instead indicating the proper intervals in each key (half-steps being understood between each E and F, and B and C). The natural key of C is placed in the middle with the sharp keys on the right and the flat keys on the left.

7. Begin at the extreme left (key of C♭), and, proceeding from left to right, notice that each key is formed by removing the flat on the 4th of the preceding key in succession till all the tones of the staff are made natural, then sharping the 4th of the preceding key in succession till all the tones of the staff are sharped; the 4th in each case becoming the 7th of the next key toward the right.

8. Now begin at the right and reverse, noticing that each

key is formed by removing the sharp on the 7th of the preceding key in succession till all the tones of the staff are made natural, then flatting the 7th of the preceding key in succession till all the tones of the staff are flatted; the 7th in each case becoming the 4th of the next key to the left.

9. It will be seen that a natural (♮ understood in the table but expressed in music) is the same as a sharp in flat keys, and the same as a flat in sharp keys.

10. Notice also, from the table, that the key-note (1) of any key is opposite 5 of the next key to the left, and opposite 4 of the next key to the right. By drawing dotted lines through the half-steps (see table) we readily see how raising the 4th a half-step (going toward the right) or lowering the 7th a half-step (going toward the left), in either case, reverses the sections, causing a readjustment of the key-note (1), which must always have the same position with reference to the sections.

11. To tell the key of any piece of music from the signature, remember that the last sharp (the one farthest to the right) is always on the 7th of the key, therefore the key letter is the first letter above; if this is too high, drop down an octave to the same letter below. Also, the last flat is always on the 4th of the key, therefore the key letter is the fourth letter below. It also happens that the next to the last flat is always on the key letter itself (see table).

12. Observe that the letters at the top of the table are the names of the keys, and the figures above the letters show the number of sharps or flats in each octave of that key (being the number of sharps or flats in the signature).

13. As each short mark between the letters on the face of Chart I. represents either the sharp of the letter below or the flat of the letter above, therefore any sharp can be changed into a flat or a flat into a sharp by changing its letter name, without affecting its tone. Thus C♯ is the same tone as D♭, D♯ same as E♭, E♯ same as F (or E same as F♭), F♯ same

as G♭, G♯ same as A♭, A♯ same as B♭, and B♯ same as C (or B same as C♭). This is called the *Enharmonic Change.*

14. Set the major key pattern to the key of C♯ and notice that it is the same as the key of D♭, as the key-note (1) will have to be set to the same mark in either case; and it only requires the enharmonic change of each tone to pass from one key to the other. Therefore the keys of C♯ and D♭ are equivalent or interchangeable keys. For the same reason, the keys of F♯ and G♭ and the keys of B and C♭ are equivalent or interchangeable keys. We see, therefore, that although theoretically there are fifteen major keys yet actually there are only twelve.

Fig. 9. Key Circle.

15. Now suppose that the major key table is cut out and bent around in a circle (Fig. 9), the first three and last three keys overlapping (being interchangeable keys). This gives the key circle. The relations of the keys already pointed out may be followed continuously around the circle by making the enharmonic change at any one of the three sets of interchangeable keys.

16. It will be seen from the top of the major key table and also from the table at top of Chart I., that there are both a sharp and a flat key on each letter of the staff. Either key may be changed to the other by simply changing the signature without changing the notes on the staff, but the pitch of the entire piece of music thus changed will be either raised or lowered (as the case may be) one half-step in tone. Thus the key of E (four sharps) may be changed to the key of E♭ (three flats) by changing the signature, as it is only by the signature that we can tell whether the music is written in the key of E or E♭. This is because in music the lines of the staff are

spaced equally and every note is either on a line or space, and sharping or flatting it does not change its position on the staff.

17. Comparing this change with the enharmonic change, we see that in this change to a key on the same letter, the names and therefore the position of the notes on the staff are not changed but the tones themselves are changed one half-step. In the enharmonic change, the tones are not changed, but their names and therefore position on the staff are changed one degree.

18. The relationship between any two keys depends upon the number of tones common to both Thus if the signatures of two keys differ by only one sharp or flat, the keys are in first relationship, as all the tones are common but one. If their signatures differ by two sharps or flats, the keys are in second relationship, etc. The major key table shows the order of relationship of major keys.

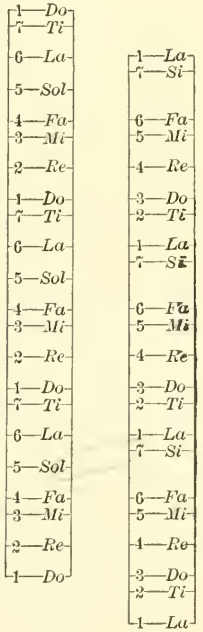


Fig. 10

INTERRELATIONSHIP OF MAJOR AND MINOR KEYS

1. In Fig. 10 the major and minor key patterns are placed side by side for comparison. Observe that in the *major* key pattern there is always a half-step between 3 and 4 and between 7 and 1 in each octave, and that in the *minor* key pattern there is always a half-step between 2 and 3 and between 5 and 6 and between 7 and 1 and an augmented or enlarged interval (equal to $1\frac{1}{2}$ steps) between 6 and 7. Observe also that sharping the 5th (Sol) of the major key pattern and changing the key-note (1) to La gives the minor key pattern. This is called the *relative minor*, because of

its close relationship to its *relative major* (differing by only one tone).

2. Minor keys have no signatures of their own. *Relative* minor keys use the signatures of their relative majors. They are recognized, however, by the accidental sharp or natural on 5 of the major key; also, when the music begins in a minor key, the bass, and sometimes the soprano, begins on *La* instead of *Do*.

3. Observe (Fig. 10) that, as the syllables all match (except that Sol being sharped is changed to *Si*), there is no difference in reading the music (with the syllables) except that the accidental on 5 of the major (or 7 of the minor) is called *Si*. Notice that the 5th of the major is sharped and becomes the 7th of the minor; so that the rule that *the last sharp is always on the 7th of the key* holds good in minor as well as in major keys.

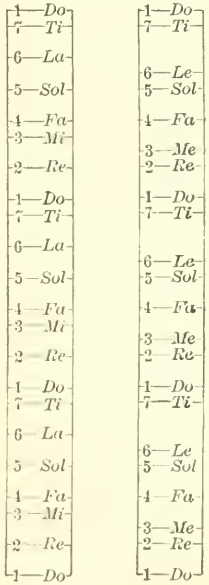


Fig. 11

4. The minor key (like the major) takes the name of the letter on which its key-note (1) is placed, and which is always the third letter below the key letter of its relative major. Thus the relative minor of C major is A minor.

5. Set the minor key pattern (Chart I.) to any key and set the major key pattern to the corresponding relative major key, and compare.

6. In Fig. 11 the minor key pattern is placed so that its key-note is opposite the key-note of the major pattern. It will be seen that the figures match except 3 and 6, and that flatting 3 and 6 of the major will give the minor key pattern. This is called the *tonic minor* (the key-note of any key is called the tonic). The *tonic minor* is so called because its tonic corresponds to the tonic of the major,

and from this view is more closely related than the *relative* minor; but on the other hand, the relative minor, differing from the major by one tone, is more closely related than the tonic minor, which differs by two tones, so that they about balance in point of relationship to the major.

7. The *tonic* minor of any major key is also the *relative* minor of the major key on the third letter above; also, the *relative* minor of any major key is also the *tonic* minor of the major key on the third letter below (or on the same letter as the minor).

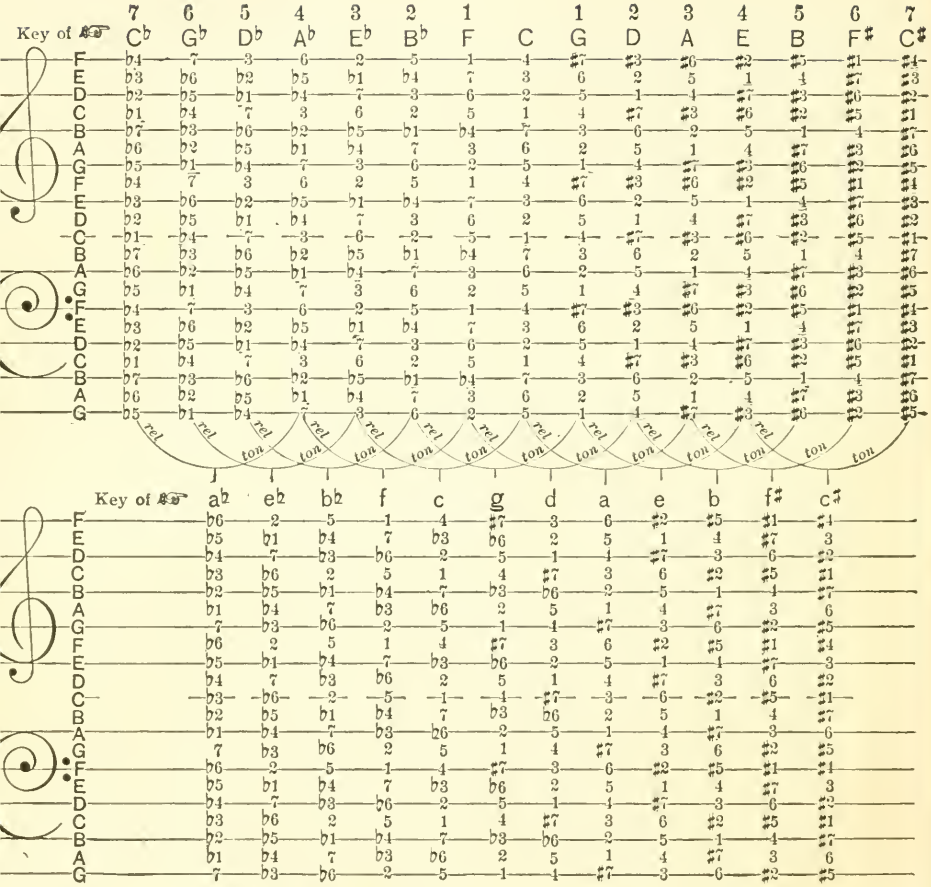
8. In the tonic minor (Fig. 11) the syllables remain as in the major, except that *Mi* and *La*, being flatted, are changed to *Me* and *Le* (see Fig. 2, p. 21, and observe the Italian pronunciation).

9. Set the minor key pattern (Chart I.) to the relative minor of C major by setting Do (3) opposite C, and 1 (La) opposite A. This will be the key of A minor. Now set the major key pattern to the key of C (relative major of A minor), and observe that the minor is formed by sharping G, which is the 5th of the major or the 7th of the minor.

10. Now set the major pattern to the key of A (tonic major), and observe that the minor is formed by making natural (equivalent to flatting) C and F, which are the 3d and 6th of both the major and minor keys.

11. In the same way, set the minor pattern so as to give the relative minor of all the sharp keys in succession, then all the flat keys in succession; and at each move comparing as before with the corresponding relative and tonic majors. Remember that removing a sharp is equivalent to flatting, and removing a flat is equivalent to sharping.

12. The Combined Key Table on next page shows both the major and minor keys. For the sake of distinction, A, B, C, etc., represent major, and *a*, *b*, *c*, etc., minor keys. Each minor key is represented as suspended from both its relative major and tonic major. (Evidently, the minor keys


7 6 5 4 3 2 1 1 2 3 4 5 6 7
Key of 𝄢 C♭ G♭ D♭ A♭ E♭ B♭ F C G D A E B F♯ C♯
F E D C B A G F E D C B A G F E D C B A G
rel ton rel ton rel ton rel ton rel ton rel ton rel ton rel ton rel ton rel ton rel ton rel ton rel ton
Key of 𝄢 a♭ e♭ b♭ f c g d a e b f♯ c♯
F E D C B A G F E D C B A G

COMBINED MAJOR AND MINOR KEY TABLE.

might have been placed between the major keys on the same staff, but this would have been more confusing; however, staffs having the same clef are to be regarded as the same.)

13. Observe that each minor key is formed either by sharping 5 of its relative major or by flatting 3 and 6 of its tonic major, and that therefore the relative minor key and tonic minor key do not mean two separate keys, but *one* and the *same* key; its name depending on which major key signature it is used with. If it is used with signature of its relative major, it becomes relative minor and requires an accidental sharp or natural on 5 of the major. If it is used with the signature of its tonic major, it becomes tonic minor and requires accidental flats or naturals on 3 and 6.

14. When a piece of music is written in or begins with a minor key, the signature of the relative major is used, thus involving the fewest accidentals. This is also more convenient in reading music, as the syllables correspond (except Sol-*Si*).

15. In each of the three sharp keys (B, F♯, C♯) on the right of the major key table, 5 of the key is already sharped, therefore to form the relative minor of each of these keys we would have to double sharp the 5th of the key. Also in the three flat keys (C♭, G♭, D♭) on the left, where 3 and 6 are already flatted, would require double flats in forming their tonic minors. But the three sharp keys on the right and the three flat keys on the left are equivalent or interchangeable keys, which overlap in the Key Circle (Fig. 9). Therefore the minor key table completes the circle of minor keys, and any extension to the right or left would form overlapping keys.

16. In analyzing the minor key table, to study the relations existing between the minor keys, we must take into account its twofold nature—tonic and relative.

17. Analyzing the table from the tonic view, we observe

that each minor key corresponds to its tonic major as to the position of the figures on the staff. Now beginning at the left, notice that 4 of each key is made natural or sharped and becomes 7 of the next; or beginning at the right and reversing, 7 of each key is made natural or flatted and becomes 4 of the next. This relation is the same as already observed in the major key table (4 and 7 being same in both tonic major and minor keys).

18. Analyzing the table from the relative view, we observe that 6 and 2 of any minor key are the same as 4 and 7 of its relative major (see Fig. 10, p. 43). Now, beginning at the left, we notice that 6 of each key is made natural or sharped and becomes 2 of the next; or beginning at the right and reversing, 2 of each key is made natural or flatted and becomes 6 of the next. This is also the same relation as observed in the major key table, but from the relative view.

19. We observe in the major key table, beginning at the left, that 4 made natural becomes 7 of the next key, and remains natural through seven keys, then sharped and remains sharped to end of table; or beginning at the right and reversing, 7 made natural becomes 4 of next key, and remains natural through seven keys, then flatted and remains flatted to end of table.

20. In the minor key table, from tonic view, beginning at the left, we observe that 4 made natural becomes 7 of next key, and remains natural (except ♭3 and ♭6) through seven keys, then sharped and remains sharped (except 3 and 6) to end of table; or beginning at the right and reversing, 7 made natural becomes 4 of next key, and remains natural (except ♭6 and ♭3) through seven keys, then flatted and remains flatted to end of table. We notice that 6 and 3 (flat or natural) form exceptions to the regular order shown in the major key table, thus indicating their accidental character; these being the tones which are made natural or flatted to form the tonic minor.

21. Again, from the relative view (6 and 2 being same as 4 and 7 of relative major), beginning at the left, observe that 6 made natural becomes 2 of next key, and remains natural (except ♯7) through seven keys, then sharped and remains sharped to end of table; or beginning at the right and reversing, 2 made natural becomes 6 of next key, and remains natural (except ♯7) through seven keys, then flatted and remains flatted (except 7) to end of table. We notice that 7 (sharp or natural) forms an exception to the regular order, thus indicating its accidental character; it being the tone which is made natural or sharped to form the relative minor.

22. Observe also that these three figures are always found side by side in the same order—thus 7, 3, 6—and that from the tonic view 6 and 3 are accidental (7 being regular as in tonic major), but from the relative view 7 is accidental (6 and 3 being regular as in relative major).

23. Now combining the tonic and relative natures, beginning at the left (regarding 7 as accidental), each key is formed (toward the right) by making natural or sharping 4 and 6 of one key, which becomes 7 and 2 of the next; or beginning at the right and reversing (regarding 6 and 3 as accidental), each key is formed (toward the left) by making natural or flatting 7 and 2 of one key, which become 4 and 6 of the next.

24. In the major key table the key of C is the limit of both sharps and flats, while its tonic minor is the limit of sharps and its relative minor the limit of flats in the minor key table.

25. The keys of *g* and *d* minor (where the sharp and flat sides of the minor table overlap) have both sharps and flats. These keys (being between the relative and the tonic minor of C major) may be called the *interminor* keys of C major.

26. The keys of *d* and *c* minor, differing from the key of C major by the same number of accidentals, are in this sense

equal in point of relationship to C major; however, C major is more closely related to its tonic (*c*) minor by having the same key-note, or tonic. In the key of *d* minor, a flat ♭ (a ♯ used as a flat) is understood on 3 (3 being sharp in its tonic, D, major).

27. The minor key mode, from the tonic view, is best seen in the key of *c* minor, as it contains only the accidental flats on 3 and 6 (there being no signature flats in its tonic, C, major), and, from the relative view, is best seen in the key of *a* minor, as it contains only the accidental sharp on 7 (there being no signature sharps in its relative, C, major).

28. The combined tonic and relative views of the minor key mode is best seen in the key of *g* minor; the tonic minor being seen in the flats on 3 and 6 (the sharp on 7 being the signature of its tonic, G, major), and the relative minor being seen in the sharp on 7 (the flats on 3 and 6 being the signature of its relative, B♭, major).

29. Though the minor mode exists in the other minor keys (all conforming to the same pattern), yet it is not so plainly pictured in the table, owing to the signature sharps or flats (also naturals, understood in the table) involved.

30. In the *sharp* minor keys the minor mode is seen from the relative view in the sharp on 7 (the other sharps belonging to the relative major), and seen from the tonic view in the flat naturals (understood) on 3 and 6 (3 and 6 being sharp in the tonic major).

31. In the *flat* minor keys the minor mode is seen from the relative view in the sharp natural (understood) on 7 (7 being flat in the relative major), and seen from the tonic view in the flats on 3 and 6 (the other flats belonging to the tonic major). (Naturals are expressed in music, but for the sake of simplicity are omitted in the key table.)

32. We observe that in minor keys the last flat is on 6 (the flat on 3 being the same as the flat on 6 of the preceding key); also, that the flat on 6 is the same as the last flat

on 4 of the relative major, and the flat on 3 is the same as the next to the last flat on 1 of the relative major.

33. Hence we have the general rule: *The last sharp is always on the 7th of the key (major or minor); the last flat is always on the 4th in major keys, and on the 6th in minor keys.*

34. Relative minor keys are recognized by the accidental sharp or natural on 5 of the major (7 of minor). Tonic minor keys are recognized by the accidental flat or natural on 6 or 3, or both.

35. The sharp or natural on 7 is for the purpose of forming the half-step between 7 and 1 (see Fig. 10). The flats or naturals on 6 and 3 are to form the half-steps between 5 and 6 and between 2 and 3 (see Fig. 11).

36. In major keys the sharps or flats of any key are retained in the following key, so that the signature of each key in succession is built up, as it were, by adding the new sharp or flat to the signature of the preceding key.

37. In relative minor keys the last sharp (on 7) is not retained in the two following keys and is therefore accidental, so that it could have no place in building the signature (the signature of the relative major being used with accidental sharp on 7 of the minor, or 5 of major).

38. In the tonic minor keys the last flat on 6 is retained on 3 of the following key but is dropped in the next key, and is therefore accidental, so that it could have no place in building the signature (the signature of the tonic major being used with accidental flats on 6 and 3).

39. Bear in mind that the sharps and flats in either table always show what letters of the staff are to be sharped or flatted, and that the figures only show the key number of each letter in each separate key. The letters, however, are only the names of the lines and spaces of the staff, so that, strictly speaking, it is the lines and spaces (or the tones they represent) that are sharped or flatted.

40. Fig. 9 (p. 42) shows the major key table bent around in a circle. In the same way, the combined key table may be bent around in a circle, forming the combined major and minor key circles (the minor key circle being complete but not overlapping).

41. Both major and minor key tables may be extended, either to the right or left or both, by merely continuing the same relations. Extending the table in either direction will involve double sharps or flats (as the case may be). The double sharps and flats will occur in exactly the same order as the first sharps and flats, and the key letters will occur in exactly the same order as they first occur (the second occurrence of any key letter being marked ♯ or ♭, as the case may be). Of course extending either table only means additional overlapping keys in the key circle.

42. When a double sharp or flat occurs in a piece of music it is as an accidental on a line or space already sharped or flatted in the signature. A double sharp is usually written thus, ×; and a double flat thus, 𝄫. When thus written on a line or space already sharped or flatted in the signature, it necessarily includes the sharp or flat on the same line or space in the signature, as otherwise the note affected would be triple sharped or flatted.

43. A double sharp raises the tone a whole step. A double flat lowers the tone a whole step.

44. Keys which involve an extension of either table are used only in modulation, and will be referred to again under "Modulation."

MELODIC MINOR SCALE

1. The key-note (1) of any key is the controlling tone of that key, as it is the tone of complete repose, or home feeling, and therefore the point of reference with which each tone is compared in its tonality.

2. The tone a half-step below the key-note is called the

leading tone, because it tends to lead to the key-note, thereby emphasizing the importance of the key-note.

3. This leading tone is now generally regarded as an essential feature of all keys, major or minor, in order to give due prominence to the key-note (the trained ear seeming to require it). This is the reason for sharping the 7th in relative minor keys, as otherwise the minor key would have no leading tone a half-step below the key-note.

4. Sharping 7 leaves an augmented interval between 6 and 7. This can only be remedied by sharping 6 also, thus:

This would give the scale too much of a major character, as will be seen later.

5. As a leading note is not needed descending the scale, we may (after sharping both 6 and 7 ascending the scale) make both natural descending, thus:

This is called the **Melodic Minor Scale,** but cannot correctly be called a key (family of related tones), as it is one family ascending and another family descending; nor a mode, as it is one mode of arrangement ascending and another mode descending. In minor keys the ♯6 and ♮7 are only used as melodic or passing notes (p. 87), but are never used in chord formations as harmony notes.

6. **Harmonic Minor** is the general name for both relative and tonic minor, to distinguish from Melodic Minor.

THE OLD MINOR MODE

1. The original or *old minor* pattern, or mode, differs from the major pattern only in the key-note being *La* instead of *Do*. It is sometimes found in old tunes, as the following:

Idumea.

Observe that the music begins and ends on La, and that the 7th (Sol) is not sharped.

2. If in the minor key table (p. 46) the figure 7 is made natural where sharped and flatted where natural, the table would show all the minor keys according to the *old minor mode*. Observe that each key would differ from its relative major only in the position of the figures on the staff, and from its tonic major by flats or naturals on 3, 6, and 7.

3. The *modern* minor mode (which is the old minor with the 7th sharped) is most generally adopted, yet the *old* minor mode is still occasionally used; while the *melodic minor scale* is a sort of compromise.

THE ANCIENT GREEK MODES

1. Observe that in the major pattern each octave is made up of five whole steps and two half-steps, the mode of arrangement placing the half-steps between 3 and 4, and 7 and 1; but the steps and half-steps may be arranged in seven principal ways, as shown in Fig. 13. These were all used in the music of the Ancient Greeks, and hence are called the Ancient Greek Modes.

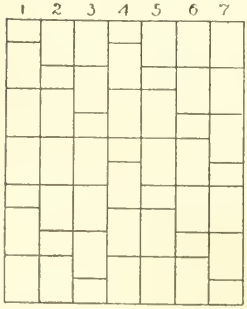


Fig. 13.

2. After the science of Harmony (combining of tones) began to develop, it was found that two of these, the 1st and the 6th (corresponding to our major and old minor modes), were best suited for *harmonization*. The others, therefore, have become obsolete.

3. Observe that the word *mode* refers to the mode of arrangement of the steps and half-steps, and the word *key* refers to the mode as adjusted to a certain pitch. The word *pattern* refers to the means of representing the intervals of the mode to the eye, thus being to the eye what the mode is to the ear.

4. We see that while there are only two modes now in common use, yet by adjusting the key-note of each of these modes successively to correspond in pitch to the twelve different half-steps into which the octave is divided, we get twelve major and twelve minor keys.

THE HARMONIC SCALE NAMES

1. The *1st* of any key is called the *Tonic*, or key-note; it is the tone upon which the key is founded, and is the point of repose or home feeling, and the point from which all the other tones of the key are measured. The *2d* of any key is called the *Super-tonic* (meaning above the tonic); the *3d* of any key is called the *Mediant* (midway between the tonic and the dominant); the *4th* of any key is called the *Sub-dominant* (dominant below the tonic—being the 5th below the tonic above); the *5th* of any key is called the *Dominant* (dominating over the other tones in the closeness of its relation to the tonic); the *6th* of any key is called the *Sub-mediant* (mediant below the tonic—midway between the sub-dominant and tonic above); the *7th* of any key is called the *Sub-tonic* (below the tonic)—it is also called the leading tone, as it leads to the tonic above. Thus the super-tonic, mediant, and dominant (being more closely related to the tonic below) are regarded as above the tonic, and are together called the dominant side of the scale; while the sub-tonic, sub mediant, and sub-dominant (being more closely related to the tonic above) are regarded as below the tonic (*sub* meaning *below*), and are together called the sub-dominant side of the scale. The tonic is thus the center, or pivot, around which the key forms.

INTERVALS

1. Intervals are the distances between sounds as regards pitch. The interval from 1 to 2 is called a second; 1 to 3, a third; 1 to 4, a fourth; 1 to 5, a fifth; 1 to 6, a sixth; 1 to 7, a seventh; 1 to 1 above, an octave.

2. The natural intervals upward from 1 of the major key pattern are taken as the standards of measurement and called major, except the 1st, 4th, 5th, and octave, which are called perfect, thus: 1 to 1 (unison) is called a perfect 1st, or prime; 1 to 2, equal to 1 whole step (see major pattern), is called a major 2d; 1 to 3, equal to 2 whole steps, is called a major 3d; 1 to 4, equal to 2½ steps, is called a perfect 4th; 1 to 5, equal to 3½ steps, is called a perfect 5th; 1 to 6, equal to 4½ steps, is called a major 6th; 1 to 7, equal to 5½ steps, is called a major 7th; 1 to 1 (above), equal to 5 steps and two ½ steps, is called a perfect octave. A 9th (compound 2d), 10th (compound 3d), etc., are the same intervals extended beyond the compass of an octave and are called compound intervals, while the intervals within the compass of an octave are called simple.

3. A minor interval is ½ step less than major; a diminished interval is ½ step less than minor or the perfects (1st, 4th, 5th, 8ve); an augmented interval is ½ step greater than major or the perfects.

4. With these standards we can measure the interval between any two tones of the scale.

5. Now analyze all the intervals of the major key pattern, beginning with 2 instead of 1; then beginning with 3, etc. Analyze all the intervals of the minor key pattern in the same way.

6. Inverted intervals are those with the tones inverted: thus, 1 to 2 inverted is 2 to 1 above, etc. Therefore a 2d inverted becomes a 7th, a 3d becomes a 6th, etc. Also a diminished interval inverted becomes an augmented interval, and *vice versa;* a minor interval inverted becomes a major, and

vice versa. The perfect intervals inverted remain perfect intervals: thus, a perfect 1st inverted becomes a perfect octave, and *vice versa;* a perfect 4th inverted becomes a perfect 5th, and *vice versa.* This is because 1 and 1 are the extremes of the octave, while 4 and 5 together are the middle of the octave.

7. The natural, or diatonic, intervals of any key are those which do not involve accidentals. Those involving accidentals are called chromatic or altered intervals.

8. Observe that in figuring intervals we count both limits: thus, 5 to 7 is a 3d, because 5 and 7 are both counted (involving three figures—5, 6, 7).

9. 1 to 1♯ and 1 to 2♭ are evidently the same interval (½ step), but differently figured; the first involves but one figure, or degree, and is an augmented 1st, while the second involves two figures and is a minor 2d.

10. Observe by comparing that the following intervals are equal: augmented 1st = minor 2d (each ½ step); major 2d = diminished 3d (1 step); aug. 2d = minor 3d (1½ steps); major 3d = dim. 4th (2 steps); aug. 3d = perfect 4th (2½ steps); aug. 4th = dim. 5th (3 steps); perfect 5th = dim. 6th (3½ steps); aug. 5th = minor 6th (4 steps); major 6th = dim. 7th (4½ steps); aug. 6th = minor 7th (5 steps); major 7th = dim. octave (5½ steps); aug. 7th = octave (6 steps). Thus by an enharmonic change (p. 41 : 13) of one tone, each interval may be expressed in two ways.

11. The major, minor, and perfect intervals are most used. The intervals of less frequent use are augmented 2ds, 4ths, 5ths, and 6ths, and diminished 5ths and 7ths. All these, except the aug. 6th, are to be found as diatonic intervals. The aug. 2d is found between 6 and 7 of minor keys (see pattern); the aug. 4th, between 4 and 7 in major and minor keys; the aug. 5th, between 3 and 7 in minor keys; the dim. 5th, between 7 and 4 in major keys and between 7 and 4, and 2 and 6, in minor keys; and the dim. 7th, between 7 and 6 in minor keys. Otherwise they are chromatic intervals.

Intervals may be chromatic in one key and diatonic in another.

12. Intervals are also concordant (smooth) or discordant (rough). The perfect concords are the octave, perfect 5th, and perfect 4th. The imperfect concords are the major and minor 3ds and 6ths. The discords are the major and minor 2ds and 7ths, and augmented and diminished intervals.

13. Observe that intervals are reckoned upward (not downward, unless so stated), because the lowest note is the bass (base), or foundation; and calculations are therefore made from it instead of from the highest note.

14. Nature divides the music scale into octaves, and subdivides the octaves into perfect 5ths, plus perfect 4ths. These are called the perfect intervals. Taking the difference between the perfect 5th and perfect 4th we get the interval of a whole step. Taking this as a measure, we find that it is contained in the perfect 4th two and one-half times, and in the perfect 5th three and one-half times. Beginning at 1 and measuring upward, the half-steps come between 3 and 4, and between 7 and 1, thus forming the major *diatonic* scale. Now using the half-steps as a measure, the whole steps will be divided into half-steps, thus forming the *chromatic* scale.

15. To assist in recognizing the intervals on the staff we may observe that intervals represented by the odd figures (3ds, 5ths, 7ths, etc.) are like situated (both notes forming the interval being on lines or spaces), and the intervals represented by the even figures (2ds, 4ths, 6ths, 8ves, etc.) are unlike situated (one note being on a line and the other on a space); also that the interval between the bass and treble staffs counts only for a 5th, regardless of the distance of separation between the staffs.

PART SECOND

STRUCTURE OF MUSIC

HARMONY

1. **Harmony** relates to the combining of tones. When two or more tones that are sounded at the same time blend, they are said to harmonize or chord. If they do not blend, they are said to discord.

2. Tones are said to be consonant or dissonant according as they chord or discord. Any two tones that form between them the interval of a 2d are dissonant, while any two tones forming between them the interval of a 3d are consonant. Therefore it may be said that *harmony builds in 3ds.*

3. The alternate tones of the scale chord, while the consecutive tones discord. Therefore the harmonic scale would be ^{1}Do, ^{3}Mi, ^{5}Sol, ^{7}Ti, ^{2}Re, ^{4}Fa, ^{6}La, ^{1}Do.

4. **The Triad.**—Any three alternate tones, as $\frac{5}{3}_{1}$, form a complete chord; but if we add 7 it will form a discord and give to the whole chord a dissonant character. This is because 7 forms the interval of a 2d with 1 next above in the scale, and 1 is already a member of the chord. (In a harmonic sense all tones of the same name, though in different octaves, are regarded as the same.)

5. Again, if we take the chord $\frac{7}{5}_{3}$ and add 2, it will discord with 3 next above in the scale, and which is already a member of the chord. For the same reason we will find that

every chord of more than three tones will be dissonant. Therefore the only perfect chord is the three-toned chord.

6. The three-toned chord is called the *common chord*, or *triad*, and is the basis of all *harmony*.

Remark.—Chords expressed by the scale figures (thus, $\frac{5}{3}_{1}$, etc.) are (like the key pattern) applicable alike to all the keys; while if expressed by the fixed letters of the staff (thus, $\frac{G}{E}_{C}$, etc.), they would be expressed by different letters in the different keys, and would have to be memorized individually in all the keys, which is impracticable. The figures are movable and represent general principles, while the letters are local and represent fixed tones. The figures always represent the letters, but the same figures represent different letters in different keys. Therefore, in studying the general principles of chords it is better to use the figures.

7. **Four-part harmony** embraces four parts, or voices: bass, tenor, alto, and soprano. To make the three-toned chord a four-voiced chord, one of the tones will have to be doubled. This is not adding a new tone, but simply doubling one of the tones (same tone in different octave). Though the triad thus becomes a four-voiced chord, it is still a triad (three-toned).

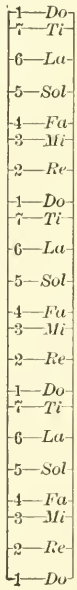
8. Any tone may be taken as the *root* or foundation of a chord, and when thus used it is called the root of the chord. The triad is then built by adding a tone a 3d above, then another a 3d above that (or a 5th above the root). Hence a triad (common chord) consists of a root note with its 3d and 5th. (The second and third members of a triad are always referred to as the 3d and 5th, thus expressing the intervals of the triad; as 1st, 3d, 5th—not 1st, 2d, 3d.)

9. In doubling one of the tones to form four-part harmony, it is usually best to double the root, as it is the principal tone; and better to double the 5th than the 3d. If the 3d is minor it may sometimes be doubled; but the major 3d should rare-

ly be doubled, because of its tendency to ascend a half-step; and doubled 3ds, being an octave apart and moving in the same direction, will produce consecutive octaves, which are forbidden (see p. 80 : 19). On the other hand, the 3d should rarely be omitted.

10. A triad takes the name of its root note and is represented, for convenience, by the corresponding roman numeral, thus: the triad of the Tonic, I.; the triad of the Supertonic, II.; the triad of the Mediant, III.; the triad of the Sub-dominant, IV.; the triad of the Dominant, V.; the triad of the Sub-mediant, VI.; and the triad of the Subtonic, VII.

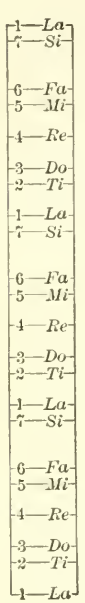
11. A triad (common chord) is called *major* when it is made up of a major 3d (2 steps) and perfect 5th ($3\frac{1}{2}$ steps) above the root, and called *minor* when made up of a minor 3d ($1\frac{1}{2}$ steps) and perfect 5th above the root. The perfect 5th is made up of a major 3d and a minor 3d, one above the other; in the major triad, the major 3d is below and the minor 3d above; in the minor triad, the minor 3d is below and the major 3d above.



12. A *diminished* triad is made up of a minor 3d and diminished 5th (or two minor 3ds one above the other). An *augmented* triad is made up of a major 3d and augmented 5th (or two major 3ds, one above the other).

13. Analyzing the triads of the major key pattern, counting the steps and half-steps in each interval, we find that the Tonic triad ($\frac{5}{3}$ Sol Mi, $\frac{}{1}$ Do) is made up of a major 3d (2 steps) andperfect 5th ($3\frac{1}{2}$ steps), and is therefore a *major* triad; Super-tonic triad ($\frac{6}{4}$ La Fa, $\frac{}{2}$ Re), made up of a minor 3d ($1\frac{1}{2}$ steps) and perfect 5th, is a *minor* triad; Mediant triad ($\frac{7}{5}$ Ti Sol, $\frac{}{3}$ Mi), made up of a minor 3d and perfect 5th, is a *minor* triad; Sub-dominant triad ($\frac{1}{6}$ Do La, $\frac{}{4}$ Fa), made up of a major 3d and

perfect 5th, is a *major* triad. In the same way, we find that the Dominant triad ($\frac{2}{7}\,\frac{\text{Re}}{\text{Ti}}\,\frac{}{\text{Sol}}$) is a *major* triad; the Sub-mediant ($\frac{3}{1}\,\frac{\text{Mi}}{\text{Do}}\,\frac{}{\text{La}}$) is a *minor* triad; and the Sub-tonic ($\frac{4}{2}\,\frac{\text{Fa}}{\text{Re}}\,\frac{}{\text{Ti}}$) is a *diminished* triad (made up of a minor 3d and diminished 5th — $2\frac{2}{2} = 3$ steps).

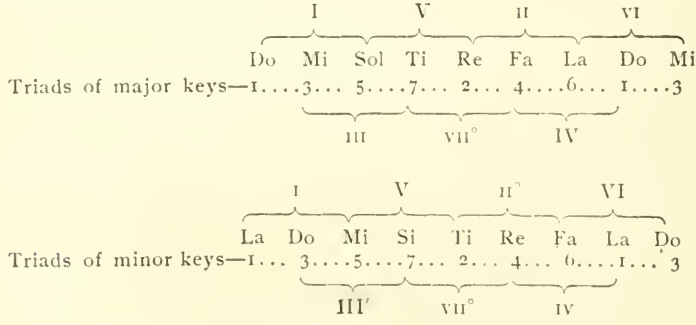


14. Analyzing the triads of the minor key pattern in the same way, we find that the Tonic triad ($\frac{5}{3}\,\frac{\text{Mi}}{\text{Do}}\,\frac{}{\text{La}}$) is a *minor* triad; the Super-tonic ($\frac{6}{4}\,\frac{\text{Fa}}{\text{Re}}\,\frac{}{\text{Ti}}$) is a *diminished* triad; the Mediant ($\frac{7}{5}\,\frac{\text{Si}}{\text{Mi}}\,\frac{}{\text{Do}}$) is an *augmented* triad (made up of a major 3d and augmented 5th—4 steps); the Sub-dominant ($\frac{1}{6}\,\frac{\text{La}}{\text{Fa}}\,\frac{}{\text{Re}}$) is a *minor* triad; the Dominant ($\frac{2}{7}\,\frac{\text{Ti}}{\text{Si}}\,\frac{}{\text{Mi}}$) is a *major* triad; the Sub-mediant ($\frac{3}{1}\,\frac{\text{Do}}{\text{La}}\,\frac{}{\text{Fa}}$) is a *major* triad; and the Sub-tonic ($\frac{4}{2}\,\frac{\text{Re}}{\text{Ti}}\,\frac{}{\text{Si}}$) is a *diminished* triad.

15. Representing the *major* triads by large roman numerals, the *minor* triads by small roman numerals; the *diminished* triads, same as minor with (°) added; and the *augmented* triad, same as major with (′) added, all the triads of both major and minor keys would be represented thus:

Triads of major keys—I, II, III, IV, V, VI, VII°.
Triads of minor keys—I, II°, III′, IV, V, VI, VII°.

Or analyzed thus:


I V II VI
Do Mi Sol Ti Re Fa La Do Mi
Triads of major keys—1....3... 5....7... 2... 4....6... 1....3
III VII° IV
I V II° VI
La Do Mi Si Ti Re Fa La Do
Triads of minor keys—1... 3....5....7... 2... 4... 6....1... 3
III′ VII° IV

Dots show number of half-steps between; .... = major 3d, ... = minor 3d.

16. We see that major keys have three major triads (I, IV, V), three minor triads (II, III, VI), and one diminished triad (VII°); and that minor keys have two minor triads (I, IV), two major triads (V, VI), two diminished triads (II°, VII°), and one augmented triad (III′).

17. Major triads have a bold, aggressive character, while minor triads have a subdued, tempering, plaintive character.

18. We have seen (p. 58:14) that the octave, perfect 4th, and perfect 5th are the principal divisions of the scale; and evidently, therefore, the divisional points 1, 4, 5 are the principal points of the scale. We noticed also the prominence of these intervals in the interrelationship of keys as shown by the major key table (p. 40); that in the ascending direction (left to right), the dominant (5) of any key is the point around which the next key forms (called therefore the key of the dominant); and in the descending direction (right to left), the sub-dominant (4) of any key is the point around which the next key forms (called, therefore, the key of the sub-dominant). In the first instance, raising the key-note (1) a perfect 5th or lowering it a perfect 4th; and in the second instance, raising the key-note a perfect 4th or lowering it a perfect 5th.

19. Naturally, therefore, the perfect intervals (octave, 4th, and 5th) are the most prominent intervals, and the tones 1, 4, 5, the most prominent tones, and the triads I, IV, V the most prominent triads, of a key. For this reason, the triads I, IV, V are called the characteristic harmonies, as they not only determine the character of the key (whether major or minor), but also form the background or framework of all music. Any tune, or melody, can be harmonized by these three chords alone, as the three together contain all the tones of the key. These chords (with the Dominant 7th) are the ones commonly used in extemporizing accompaniments on piano, guitar, or other instruments.

20. These characteristic chords (I, IV, V) are the only

major triads in any major key, and determine its major character; I and IV are the only minor triads in any *modern* minor key, and determine its minor character. In the *old* minor mode (p. 53), all three characteristic chords (I, IV, V) are minor, thus making it more distinctly minor (being symmetrically the opposite of the major mode). But the *leading* tone ($\frac{1}{2}$ step below the key-note) is now generally considered essential in order to give due prominence to the key-note, thus making it necessary to raise the 7th of the old minor mode a half-step. This makes the dominant triad (V) major.

21. Hence the law: *The Dominant Chord must be major in both major and minor keys.*

22. If we should also raise the 6th a half-step (see p. 53: 4), to avoid the augmented interval between 6 and 7, then the Sub-dominant chord (IV) would also become major, and the minor key (two of its three characteristic triads being major) would have too much of a major character.

23. Hence the law: *The Tonic* (I) *and the Sub-dominant* (IV) *triads must both be minor in minor keys.*

24. Since these laws determine the form of the characteristic triads of minor keys, they necessarily fix the mode, or pattern, of minor keys.

POSITIONS AND FORMS OF THE TRIAD

1. On the principle that harmony builds in 3ds, the natural or direct position or form of any chord is that in which its notes are arranged in 3ds; and the lowest note is therefore regarded as the root or foundation of the chord. The chord, however, may be taken in various positions and forms, but as long as the same tones are used (counting octaves as merely replicates of the same tone) it is regarded as the same chord.

2. The triad has three *positions* with reference to the soprano, or highest note, thus: if the root of the triad is in the soprano, the triad is in 1st position; if the 3d is in the soprano, the triad is in 2d position; if the 5th is in the soprano, the triad is in 3d position.

3. The triad has three *forms* with reference to the bass, or lowest note. The lowest note is always the bass (whether root, 3d, or 5th). The bass (base), as its name implies, is the base or support of the entire chord. When the root of the triad is the bass, it is called root bass and the triad direct. If the root of the triad is not the bass, the triad is said to be inverted. If the 3d is the bass, it is called the 1st inversion; if the 5th is the bass, it is called the 2d inversion.

4. Thus we see that the *position* (1st, 2d, 3d) is determined by the soprano or highest note, and the *form* (direct or inverted) by the bass or lowest note (bass and soprano being the outside and therefore most prominent parts). A triad is strongest and most independent when in 1st position with root bass, the root of the triad being thus in both bass and soprano.

5. The treble staff has to do mainly with position, and the bass staff with form. In playing the piano or organ, the right hand has to do with position; the left hand, with form.

6. Position and form are entirely independent of each other, so that any form of the triad (root, 1st inv. or 2d inv.) may be used with any position of the triad (1st, 2d, or 3d). To determine the position, we need look only at the highest note; to determine the form, we need look only at the lowest note.

7. The different positions and forms of chords relieve the monotony which would result from using only one form and position of each chord. They are also the necessary result of voice leading, as will be seen later. (To avoid the inconvenience of using both words, we may use either of the words—position or form—in a general sense; but a chord is usually referred to as direct or inverted.)

8. Fig. 14 shows the different positions and forms of the tonic triad in the key of C major.

9. When four-part harmony is written so that the three upper parts are within the compass of an octave, so they can be played with one hand, it is called *close* harmony; otherwise, it is called *open* harmony. In open harmony, tones

proper to a chord are omitted between two or more of the three upper parts.

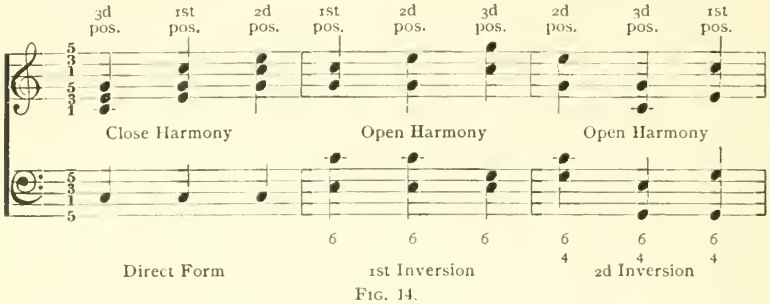


Fig. 14.

10. In Fig. 14 the figures on the staff at the left show all the tones proper to the tonic triad in the key of C.

11. Close harmony is generally used for male or for female voices alone; open harmony, for mixed voices.

12. Close harmony is usually best adapted for loud, full expression, and open harmony for soft, delicate expression. As a general rule, however, it is best to keep the parts as nearly as possible equidistant. Not more than an octave should ever intervene between any two contiguous parts, except the bass and tenor.

THOROUGH-BASS FIGURING OF TRIADS

(Figuring from the base.)

1. In the direct form of any triad, as $\frac{5}{3}$ (taking the triad I for example), the intervals figured from the bass are $\frac{5^{th}}{3d}$. Therefore, the figures $\frac{5}{3}$ (representing the intervals of the triad) stand for the direct form of the triad. When no figures are expressed, this form is understood.

2. In the 1st inversion $\left(\frac{1}{3}\right)$ the intervals figured from the bass are $\frac{6^{th}}{3d}$. Therefore, the figures $\frac{6}{3}$, or simply 6 (3 being understood), stand for the 1st inverted form of the triad.

3. In the 2d inversion $\left(\frac{3}{1}\right)$ the intervals figured from the bass are $\frac{6^{th}}{4^{th}}$. Therefore, the figures $\frac{6}{4}$ stand for the 2d inverted form of the triad.

4. Again (taking the triad IV for example), the direct form (root bass) would be $\frac{1}{6}$ — intervals $\frac{5th}{3d}$; 1st inv. $\frac{4}{6}$ — intervals $\frac{6th}{3d}$; 2d inv. $\frac{6}{4}$ — intervals $\frac{6th}{4th}$. All triads are figured the same way, therefore the figures 6 and $\frac{6}{4}$ are merely to show the inversions of the triad, and when used, are usually written under the triad (see Fig. 14). Observe that the triads are figured as if the notes were all in the same octave (octaves being regarded as merely replicates of the same tone).

5. The key figures and thorough-bass figures should not be confused, as they do not correspond except where the chord intervals and the key intervals happen both to be figured from the key-note; as the $\frac{5}{3}$ of the I triad, the $\frac{6}{4}$ of the IV triad, and the $\frac{6}{3}$ of the VI triad.

6. It should also be fixed in the mind that thorough-bass figuring is merely a system of measurement from the lowest note, and has nothing whatever to do with the generic nature of a chord. Thorough-bass figuring is useful in training the mind to measure all intervals from the bass.

7. As a matter of convenience, we may speak of the $\frac{5}{3}$ chord the 6 chord, the $\frac{6}{4}$ chord, etc., bearing in mind that these expressions refer to the form, and not to the nature of the chord.

DISSONANT CHORDS

1. Dissonant chords (or discords) are not always unpleasant, but often quite the reverse in relieving the monotony of too much concord. They make the concords more effective by contrast, and increase the means of expression, therefore they are very important in music; however, they must be short and always resolve into their proper concords.

2. The major and minor triads are the only concords; since in their different positions, while containing only consonant intervals, they contain all the possible consonant intervals.

3. **The Dissonant Triads.** Diminished and augmented triads are dissonant, because they contain the interval of a dissonant 5th—the dim. triad containing a dim. 5th, and the aug. triad containing an aug. 5th (hence their names).

4. The dim. triad is a diatonic triad on 7 in major keys, and on 7 and 2 in minor keys (see Fig. 10, p. 43). The aug. triad is diatonic only on 3 of minor keys. These triads are used in all their positions and inversions—the dim. 5th inverted becomes an aug. 4th, and the aug. 5th inverted becomes a dim. 4th, and therefore still dissonant.

5. All chords not in their diatonic position in a key are chromatic chords, as they involve accidental or chromatic tones.

6. **Extensions of the Triad.** The triad is the foundation of all chords, but on the principle that harmony builds in 3ds, we may extend the triad by adding 3ds; but any extension of the triad will involve dissonant intervals; thus, by adding a 3d to the triad we get the interval of a 7th from the root, adding another 3d we have the 9th together with the 7th, etc.

7. A chord containing the interval of a 7th is called a chord of the 7th; a chord containing the interval of a 9th is called a chord of the 9th; etc. Thus continuing to add 3ds, we would get the chords of the 11th, 13th, etc.

8. A full chord of the 7th contains four distinct tones; a full chord of the 9th contains five distinct tones, etc. If in the chord of the 7th either the 1st or 7th be omitted, the chord loses its identity by becoming a triad; or if in the chord of the 9th either the 1st or 9th be omitted, the chord loses its identity by becoming a chord of the 7th. The 5th or middle tone of a chord of the 9th is usually omitted in four-part harmony.

9. Some theorists explain these chords as combined triads (two triads combined through their common tones). Thus the triads $\frac{2}{5}\frown\frac{4}{7}$ combined through their common tones would give $\frac{4}{2}{}^{7}_{5}$ — a chord of the 7th; or $\frac{2}{5}\frown\frac{6}{4}$ combined would give $\frac{6}{4}{}^{9}_{2}{}_{5}$ — a chord of the 9th. A chord of the 11th would be two complete triads, one above the other. But the simplest method of treatment is that of extended triads.

10. As the triads are represented by the roman numerals, the extended triads may be represented by simply attaching

a figure corresponding to the distinguishing interval; thus, II_7, V_7, or V_9, etc.

11. **Chords of the 7th.** A 7th chord contains six intervals, which in the direct close form of the chord are: three 3ds one above the other, two 5ths interlocked, and a 7th spanning all, thus: . But a closer analysis (see major and minor patterns, p. 43) will show that there are seven kinds of 7th chords, outlined as follows:

Class	7th Chords in Direct Close Form	Analysis
1st	Major triad with major 7th—I_7 and IV_7 in major keys, and VI_7 in minor keys.	major 3d+minor 3d+major 3d, two perfect 5ths interlocked, major 7th spanning all.
2d	Minor triad with minor 7th—II_7, III_7 and VI_7 in major keys, and IV_7 in minor keys.	minor 3d+major 3d+minor 3d, two perfect 5ths interlocked, minor 7th spanning all.
3d	Major triad with minor 7th—V_7 in both major and minor keys.	major 3d+minor 3d+minor 3d, perfect 5th and dim. 5th interlocked, minor 7th spanning all.
4th	Minor triad with major 7th—I_7 in minor keys.	minor 3d+major 3d+major 3d, perfect 5th and aug. 5th interlocked, major 7th spanning all.
5th	Dim. triad with minor 7th—VII°_7 in major keys, and II°_7 in minor keys.	minor 3d+minor 3d+major 3d, dim. 5th and perfect 5th interlocked, minor 7th spanning all.
6th	Aug. triad with major 7th—III'_7 in minor keys.	major 3d+major 3d+minor 3d, aug. 5th and perfect 5th interlocked, major 7th spanning all.
7th	Dim. triad with dim. 7th—$\underline{VII}^{\circ}_7$ in minor keys.	Three minor 3ds, one above the other, two dim. 5ths interlocked, dim. 7th spanning all.

Class—	1st	2d	2d	1st	3d	2d	5th
7th Chords in Major Keys	I_7	II_7	III_7	IV_7	V_7	VI_7	VII°_7

Class—	4th	5th	6th	2d	3d	1st	7th
7th Chords in Minor Keys	I_7	II°_7	III'_7	IV_7	V_7	VI_7	$\underline{VII}^{\circ}_7$

12. Observe, as to the number of dissonant intervals contained in each class: the *1st* contains one (major 7th); the *2d*, one (minor 7th); the *3d*, two (dim. 5th and minor 7th); the *4th*, two (aug. 5th and major 7th); the *5th*, two (dim. 5th and minor 7th); the *6th*, two (aug. 5th and major 7th); the *7th*, three (two dim. 5ths and a dim. 7th)—thus giving a comparative idea of their dissonant character, although some dissonant intervals are more dissonant than others.

13. To become more familiar with the structure of these chords by comparisons, we may make the following observations:

First, that the *3d* and *5th*, also the *4th* and *6th* classes are composed of the same intervals, but in reverse order.

Second, that in the *1st* and *2d* classes the intervals that are major in one are minor in the other.

Third, that major 3d + minor 3d = perfect 5th; minor 3d + minor 3d = dim. 5th; and major 3d + major 3d = aug. 5th.

Fourth, that IV_7 and VI_7, VII°_7 and II°_7, II_7 and IV_7, are, each pair, one and the same chord in *relative* major and minor keys (Fig. 10, p. 43), and that V_7 is one and the same chord in *tonic* major and minor keys.

Fifth, that the *stroke* under $\underline{VII}^{\circ}_7$ in minor keys is to distinguish it from VII°_7 in major keys.

Sixth, that the *1st* and *2d* classes occur more than once in any major key, and the other classes occur only once in any key.

Seventh, that the form of the $\underline{VII}^{\circ}_7$ is not changed by inverting it; as the 3ds are equal, and each equal to the augmented 2d ($1\frac{1}{2}$ steps), and together equal an octave, and therefore form the same intervals in any order (see minor pattern).

14. The inverted forms of these chords (except the $\underline{VII}^{\circ}_7$) would, of course, involve different combinations; as 3ds invert into 6ths, 5ths into 4ths, and 7ths into 2ds (major into

minor and *vice versa*, dim. into aug. and *vice versa*, and perfect into perfect), but dissonant intervals invert into dissonant intervals, and consonant into consonant, so that the dissonant character of the chords is but little changed.

15. The intervals do not all invert at once, but in the order shown in Fig. 15.

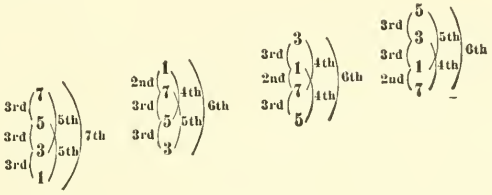


Fig. 15.

16. The chords of the 7th, with their inversions, are all more or less used, but some are much more prominent and important than others. Those of special importance are the V_7 (called the Dominant 7th) and the VII°_{7} (called the Diminished 7th) chords. These are the principal chords used in modulation, and will be more fully described under "Modulation."

17. **Positions and Forms of the 7th Chords.** A chord of the 7th has four positions, as each tone may be in the highest voice; also, four forms (direct, and three inversions), as each tone may be in the bass.

2d pos. 3d pos. 4th pos. 1st pos. 3d pos. 4th pos. 1st pos. 2d pos. 4th pos. 1st pos. 2d pos. 3d pos.
Direct form
1st Inv.
2d Inv.
3d Inv.
7 7 7 6 6 6 4 4 4 2 2 2
5 5 5 3 3 3

Showing the positions and forms of the V_7 chord in the key of C.

Fig. 16.

18. **Thorough-bass Figuring of 7th Chords.** Taking the V_7 chord as an example and figuring the intervals from the bass, we find that when the bass is the root $\left(\begin{smallmatrix}4\\2\\5\end{smallmatrix}\right)$ the intervals of the other parts from the bass are $\begin{smallmatrix}7\text{th}\\5\text{th}\\3\text{d}\end{smallmatrix}$ — the figure 7 represents the chord in direct form. In the 1st inversion $\left(\begin{smallmatrix}5\\4\\2\\7\end{smallmatrix}\right)$ the intervals would be $\begin{smallmatrix}6\text{th}\\5\text{th}\\3\text{d}\end{smallmatrix}$ — $\frac{6}{5}$ shows 1st inversion. In the 2d inversion $\left(\begin{smallmatrix}7\\4\\2\end{smallmatrix}\right)$ the intervals would be $\begin{smallmatrix}6\text{th}\\4\text{th}\\3\text{d}\end{smallmatrix}$ — $\frac{4}{3}$ shows 2d inversion. In the 3d inversion $\left(\begin{smallmatrix}2\\4\\4\end{smallmatrix}\right)$ the intervals would be $\begin{smallmatrix}6\text{th}\\4\text{th}\\2\text{d}\end{smallmatrix}$ — $\frac{4}{2}$, or simply 2, shows 3d inversion.

19. It will be noticed that the abbreviated figuring of each form represents the intervals peculiar to that form; the other intervals, which are always built in 3ds and therefore implied, are omitted for the sake of brevity. All 7th chords are figured the same way; therefore, these figures are only to show the form of the chord (whether direct, 1st, 2d, or 3d inversion). (See Fig. 16.)

20. **The Chord of the 9th** (figured $\frac{9}{7}$). The chords of the 9th, 11th, etc., are used practically only on the dominant. (When on any other note than the dominant, 9ths, 11ths, etc., are usually regarded as suspensions.)

21. The full chord of the 9th in its direct close form consists of ten intervals, analyzed in major keys, thus:

V_9 $\left(\begin{smallmatrix}6\\4\\2\\7\\5\end{smallmatrix}\right)$ | Major 3d + minor 3d + minor 3d + major 3d.
Two perfect 5ths linked together by dim. 5th.
Two minor 7ths interlocked.
A major 9th spanning all.

It contains, therefore, four dissonant intervals (dim. 5th, two minor 7ths, and a major 9th). In minor keys it would contain five dissonant intervals (two dim. 5ths, minor 7th, dim. 7th, and a minor 9th). It is used in its 1st, 2d, and 3d inversions.

22. If the root of the V_9 chord is omitted, it becomes either the VII°_{7} or $\underline{\text{VII}}^{\circ}_{7}$ chord, according as the 9th is major

or minor. As these two chords have no perfect 5th, and on the principle that every fundamental chord should have a perfect 5th, some theorists regard them as V_9 chords with root omitted, thus including them in the general class of dominant harmony.

23. **Chords of the 6th.** From Fig. 15 (p. 71) we see that a chord of the 7th (like the triad) inverts into a chord of the 6th (spanned by a 6th), and the first inversion has the appearance of being a triad with a 6th added, so that Fig. 15 may be regarded either as a chord of the 7th with its inversions or as a chord of the 6th with its inversions (the direct form of the 7th chord being the 3d inversion of the 6th chord); but on the principle that harmony builds in 3ds, it is more correct to regard this as a chord of the 7th. However, the 1st inversion of the 7th chord, when it consists of a major triad with a major 6th (as in the 1st inv. of the *2d* class, p. 69), it is often called a chord of the *Added 6th*.

24. In the analysis of the *2d* class (p. 69), we see that the three upper parts of the 7th chord form a major triad as against the minor triad formed by the three lower parts (regarding the 7th chord as two overlapping triads); and in view of the stronger and more aggressive character of the major triad, the 1st inversion, which places it below as the foundation, may therefore be regarded as the fundamental position of the chord; hence, the justification of the added 6th chord. Observe that this is the case only in 7th chords of the *2d* class (formed by adding a minor 7th to a minor triad).

25. The 1st inversion of a major triad is sometimes called the *Neapolitan 6th*. It consists of a tone with its minor 3d and minor 6th.

26. The *Augmented 6th* chord is a chord containing an aug. 6th. By examining the major and minor patterns, it will be seen that the aug. 6th is not a diatonic interval of either. It is formed only by augmenting a major 6th, and is therefore a chromatic interval, and the aug. 6th chord is therefore a

chromatic chord in any key. It exists in three forms: Italian 6th, French 6th, and German 6th. (These are fully described on p. 104.) All other chords are diatonic in some key, and when used in other keys as chromatic chords, they have a tendency to lead to the key in which they are diatonic, or natural, thus tending to induce modulation (change of key).

INTERRELATIONSHIP OF CHORDS IN GENERAL

1. Chords may be related in three ways: first, through belonging to the same diatonic scale (common key relationship); second, through the relationship of their roots (root relationship); third, through common tones (common tone relationship).

2. **Common Key Relationship.** A key is a family of tones related through belonging to the same diatonic scale; therefore, chords belonging to the same diatonic scale, or key, are related as being composed of interrelated tones. Naturally, also, those chords based on the most prominent divisional points of the scale (1, 4, 5) are most prominently related to each other through their common relationship to the key.

3. Chords thus related through belonging to the same diatonic scale are naturally associated together; hence their tendency (when used in other keys as chromatic chords) to lead to the key in which they are diatonic.

4. But certain keys (especially those closely related) have a number of tones in common, and have therefore certain chords in common, but occupying different positions (with different roman numeral name) in the different keys. These common chords naturally form connecting links between the keys containing them, and are convenient stepping-stones in passing out of one key into the other. They are called equivocal chords, because, belonging to different diatonic scales, they lead to no particular key, but to any one of the keys in

which they are common, while those chords which belong to only one diatonic scale always lead to that particular key.

5. **Root Relationship.** In this sense, chords are related in proportion to the consonance of the interval between their roots. If the interval is a perfect concord (octave, perfect 5th, or perfect 4th), we have the 1st degree of relationship. If the interval is an imperfect concord (major or minor 3d or 6th), we have the 2d degree. If the interval is a dissonance, we have the 3d degree. When the interval is an octave, the relationship is so close that the chords are regarded as one and the same.

6. **Common Tone Relationship.** Keys are naturally related in proportion to the number of tones in common; and, on the same principle, chords, whether belonging to the same key or different keys, are related in proportion to the number of tones in common.

7. In view of the different kinds of relationship, the grade of relationship between chords depends upon the number of points of relationship they contain.

INTERRELATIONSHIP OF THE TRIADS OF A KEY

1. As the triads are the foundations of all chords, it is well to notice their relation to each other in the same key.

2. The triads $\mathrm{I}\,\frac{5}{3}_{1}$, $\mathrm{III}\,\frac{7}{3}_{5}$, $\mathrm{V}\,\frac{2}{7}_{5}$, $\mathrm{VII}^{\circ}\,\frac{4}{2}_{7}$, $\mathrm{II}\,\frac{6}{4}_{2}$, $\mathrm{IV}\,\frac{1}{6}_{4}$, $\mathrm{VI}\,\frac{3}{1}_{6}$, $\mathrm{I}\,\frac{5}{3}_{1}$, have each two tones in common with those on either side (forming a complete circle of the triads), and may be called double-connected (abbreviated *dc*) triads. Thus we see that triads whose roots form the interval of a 3d are *dc* triads.

3. The triads $\mathrm{I}\,\frac{5}{3}_{1}$, $\mathrm{V}\,\frac{2}{7}_{5}$, $\mathrm{II}\,\frac{6}{4}_{2}$, $\mathrm{VI}\,\frac{3}{1}_{6}$, $\mathrm{III}\,\frac{7}{5}_{3}$, $\mathrm{VII}^{\circ}\,\frac{4}{2}_{7}$, $\mathrm{IV}\,\frac{1}{6}_{4}$, $\mathrm{I}\,\frac{5}{3}_{1}$, have each one tone in common with those on either side (also forming a complete circle of the triads), and may be called single-connected (abbreviated *sc*) triads. Thus we see that triads whose roots form the interval of a 5th are *sc* triads.

4. Triads whose roots form the interval of a 2d have no tones in common.

5. The common tone relationship of the triads may be illustrated as in Fig. 17, showing the circle of triads with the *dc* triads connected by double lines, and the *sc* triads by single lines. These common tones are called connecting or binding tones.

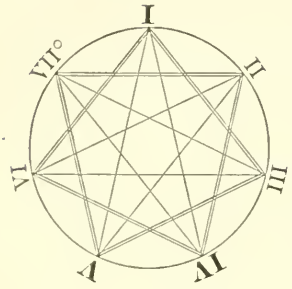


Fig. 17.

6. We see that *dc* triads are more closely related from the view of common tone relationship, and the *sc* triads are more closely related from the view of root relationship (except between diminished or augmented triads and the triad on the 5th above, where the interval between the roots is a diminished or an augmented 5th); and therefore the actual relationship in the two cases is about equal. The very close interrelationship of the triads I, IV, V, is mainly due to their occupying the places of special prominence in the same key.

7. The triads of minor keys are also related in a precisely similar way.

PROGRESSION

1. **Progression** is passing from one chord to another. Mere change of position or inversion of the same chord is not progression. A chord may pass through several positions or inversions before progressing to the next chord.

2. The interrelationship of chords forms the natural means of progression, as chords naturally lead to related chords; therefore the closer the relationship between chords the more natural the progression from one to the other, but varied relationship is necessary to varied expression.

3. If we analyze a sentence we find that all the words are grammatically related; similarly in a musical sentence, the chords should be musically related. For special effect, chords are sometimes used without musical connection, just as, for the same purpose, words are sometimes used without gram-

matical connection; but in either case, this is the exception and not the rule.

4. The common or connecting tones are the natural stepping-stones in passing out of one chord into another, and naturally, the more tones in common the less motion involved and therefore the smoother the progression. On the other hand, the more motion involved the livelier the progression.

5. When a chord progresses according to its natural tendency, it is said to resolve. The words *progression* and *resolution* are therefore, to a certain extent, synonymous; but in so far as we may draw a distinction, *progression* applies to concords, or tones free to move in any direction, having no special tendency; and *resolution*, to discords and leading tones, which have a tendency to move in a certain direction. Therefore, *progression* deals more especially with the triad, or consonant part of chords; and *resolution*, with the dissonant part of chords and leading tones.

6. **Progression of Triads.** Each tone of a triad or other chord is regarded as a voice; and *Voice Leading* consists in leading each voice of one chord to its proper place in the next chord.

7. **General Rule for Progression, or Voice Leading:** (1) *Keep the connecting tones, if any, each in the same voice in both triads;* (2) *Lead the other voice or voices one degree up or down (as the case may be), each to the nearest tone in the second triad.*

8. It will be seen that the rule involves the least motion possible. If the rule is strictly followed, we have strict voice leading; otherwise, free voice leading.

9. It may be shown that from any triad we can reach any other triad without moving any tone more than one degree. Thus, taking any triad for example, as I ($\frac{1}{5}$ 1st position). Now if all three of the tones ascend one degree, we have the triad II ($\frac{2}{6}$ 1st pos.); if all three descend one degree, we have triad VII° ($\frac{7}{4}$ 1st pos.); if the tones $\frac{5}{3}$ ascend one de-

gree, we have the triad IV ($\begin{smallmatrix}-1-\\-6-\\-4-\end{smallmatrix}$ 3d pos.); if the tones $\begin{smallmatrix}3\\1\end{smallmatrix}$ descend one degree, we have the triad V ($\begin{smallmatrix}-7-\\-5-\\-2-\end{smallmatrix}$ 2d pos.); if the tone 5 ascends one degree, we have the triad VI ($\begin{smallmatrix}-1-\\-6-\\-3-\end{smallmatrix}$ 2d pos.); if the tone 1 descends one degree, we have the triad III ($\begin{smallmatrix}-7-\\-5-\\-3-\end{smallmatrix}$ 3d pos.). Thus we have passed from I direct to each triad of the key.

10. We notice also that the different positions of chords are the necessary result of voice leading where some of the parts are held as connecting tones.

11. Progression by *sc* and *dc* triads differs only in abruptness. Thus the progression I to V may be made direct, as $\begin{smallmatrix}-5-5-\\-3-2-\\-1-7-\end{smallmatrix}$, moving both tones at the same time; or through the intermediate *dc* triad III, as $\begin{smallmatrix}-5-5-5-\\-3-3-2-\\-1-7-7-\end{smallmatrix}$, moving the same tones one at a time. The progression IV to V may be made direct (moving all three tones at the same time), or through the *sc* triad I, or through the *dc* triads II and VII°.

12. The characteristic triads I, IV, V, on account of their prominence, form the greater part of any piece of music, and the progression from one to the other is frequently direct; but we see that *dc* triads may be used between to make the progression smoother.

13. It should be remembered that the rule for progression applies only in passing from one triad to another of different name, but does not apply in passing from one position to another of the same triad (which is not progression).

14. **Rule for Skips:** *Consonant intervals may progress by skips, but dissonant intervals should be approached and quitted without skips.* The naturalness of a skip is in proportion to the consonance of the interval taken.

15. The different positions of the same triad may be used freely, as only consonant intervals are involved; but in pro-

gressing to a new triad with one or more tones dissonant to the first triad, it is best to do so with the least motion possible, by holding the connecting tones and moving the others without skips to the nearest tones of the new triad. Therefore skips most usually occur in repeating same triad in a different position. When chords progress by skips, without any definite connection, they are called leaping or jumping chords.

FIG. 18.

16. Fig. 18 illustrates the rule of progression. It will be observed that the rule applies only to the three upper parts (triad proper), but does not apply to the bass.

17. **The Progression of the Bass** involves the same principle (relationship of intervals) as the root relationship of chords. The natural tendency of the bass is to progress by consonant skips; the more perfect the interval of the skip, the more natural the progression: therefore the most natural progressions of the bass are the perfect concords (octave, perfect 5th, and perfect 4th), after these the imperfect concords (major and minor 3ds and 6ths), and lastly, the single diatonic degree or 2d.

18. The bass is usually a doubling of one of the tones of the triad above it. Its progression is therefore influenced by both considerations. Besides, if the bass progressed like the three upper parts according to the rule, we would find it impossible to avoid consecutive octaves and perfect 5ths, while the tendency of the rule, as between three parts, is to avoid them.

19. **Rule Regarding Consecutives:** *Two perfect 5ths or octaves should not occur consecutively between the same parts.*

Fig. 19.

20. They are not considered consecutive unless they occur between the same parts. Neither are repeated perfect 5ths and octaves (see Fig. 20) considered consecutives, as they are merely repetitions of the same tones and equivalent to holding two tones.

Fig. 20.

21. The general reason for the objection to consecutive perfect 5ths or octaves is due to the sense of perfectness which each carries in itself, and therefore want of connection with each other, so that the sense of relationship between the consecutive chords is lacking.

22. The special reason for the objection to consecutive perfect 5ths is due to the tendency of the perfect 5th, when used consecutively, to carry with it its key limitations, thus changing the key with each progression, often giving to the music the effect of being in more than one key at the same time.

23. The special reason for the objection to consecutive octaves (also unisons) is that they destroy the individuality of the parts moving in octaves (or unison), since two parts moving together in octaves (or unison) blend so as to sound like one part; and when the individuality is thus destroyed for a few chords only, it gives the impression of an accidental bad progression. This is not the case when the parts do not pretend to vary, as when two or more voices sing the same part in unison or octaves; thus when a man and woman sing the same part together, they naturally sing in octaves with evidently no disagreeable effect. They could not, however,

sing together in perfect 5ths without giving the effect of each being in a different key.

24. Consecutive perfect 5ths and octaves are sometimes hidden (heard but not seen). Hidden consecutives occur when two parts move by similar motion to a perfect 5th or octave, as we mentally pass through the intermediate tones which involve the perfect 5th or octave.

25. Consecutive faults can occur only in similar or parallel motion, hence oblique motion should be used as much as possible to avoid them. They are most noticeable between the outside (most prominent) parts; between the inside, and between inside and outside parts, they are sometimes allowed.

26. **Rule Regarding False Relations:** *False relations should be avoided.* A false relation is where a false (imperfect) prime, octave, or 5th is formed between two different voices in consecutive chords; thus, if a voice in one chord sings C and another voice in the next chord sings C♯, a false prime or octave relation is formed; or if a voice in one chord sings B and another voice in the next chord sings F, a false 5th relation is formed—but the same voice may sing both notes. False 5th relations are forbidden only between the outside parts.

27. A false prime or octave relation involves two keys, since the two voices are not in the same key; but if the same voice sings both notes, the second note is merely of the nature of a passing note. The same in effect is also true of the false 5th relation.

28. **Motion of the Parts.** The progression of chords with their changes of position produce what is called *motion* in the parts. There are three kinds of motion as between any two parts: *Contrary* motion (when one part ascends and the other descends); *Oblique* motion (when one part moves horizontally and the other ascends or descends); *Similar* motion (when both parts ascend or descend together). Similar motion is also called *parallel* motion when the parts move parallel to each other.

29. **Preparation of Dissonances.** A dissonant tone is said to be prepared when it appears (in the same voice) as a consonant tone in the preceding chord.

30. As a rule, *every dissonant tone, except the dominant 7th and diminished 7th (which may or may not be prepared) and passing notes, should be prepared by being first heard as a consonant tone before it is heard as a dissonant tone.* Dominant 7ths and diminished 7ths have become so familiar as to cease to require preparation. It is difficult for the voice properly to intone a dissonance, but when first intoned as a consonance it is easy to hold; hence the rule.

RESOLUTION

1. **Resolution** in its general sense applies to any tone or chord that progresses according to its natural tendency. Resolution therefore is merely natural progression. Any chord (if it cannot remain stationary) tends to move to the chord that occasions the least motion, using the common tones as connecting links. The rule for progression (p. 77 :7) is based upon this tendency; therefore chords which progress strictly according to the rule may properly be said to resolve.

2. The key-note, or tonic (1), is the tone of complete repose or home feeling in any key, and is therefore the tone to which all other tones tend for final resolution. Next to the tonic in restful character are, first the 5th, then the 3d. All other tones are restless and tend to resolve to one of these three restful tones (^{1}Do, ^{3}Mi, ^{5}Sol, in major keys; ^{1}La, ^{3}Do, ^{5}Mi, in relative minor keys).

3. The Tonic triad being composed of these three restful tones is the chord of final resolution of all other chords, and is the natural beginning as well as ending of all music; hence all music should begin and end with the Tonic triad, as well as frequently return to it (to prevent weariness) during the music.

4. As the bass is the foundation, it should begin and end on the tonic. If the soprano also ends on 1 (in octave or octaves with the bass), it is called a perfect close; but if the soprano ends on 3 or 5, it is called an imperfect close. The soprano may begin on 1, 3, or 5.

5. As already observed, resolution in its strict sense applies to discords and leading tones; and progression, to concords (discords resolve, concords progress).

6. Dissonant intervals have a determined resolution (tendency to move in a certain direction), while consonant intervals are said to be free (without tendency to move in any particular direction). 2ds, 7ths, 9ths, etc., all diminished and augmented intervals, and perfect 4ths (when just over the bass)* are classed as dissonant intervals.

7. A dissonance, or discord, is caused by a tone forming a dissonant interval with some other tone, and the tone thus causing the dissonance is called a dissonant tone.

8. All rules for Resolution are based on natural tendency, and the natural tendency is to resolve in the easiest way. A dissonant interval is, in a sense, an unnatural interval, and most naturally tends to resolve (or melt as it were) into the nearest consonant interval as being within easiest reach. For the same reason, a dissonant interval is easiest reached from the nearest consonant interval. Hence the general rule:

Rule I. *Dissonances should be approached and quitted conjunctly (by the single step of a 2d; i.e., without skip).*

9. It is usually easier for the voice to descend than to ascend, as descending tends toward relaxation, while ascending tends toward tension. For which reason, it is also a general rule:

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* The dissonance of the perfect 4th is only relative, as the perfect 4th in itself is always a consonant interval. But its natural relation in the key is as an inverted perfect 5th; and when used just over the bass, it is, in a sense, as a substitute for the perfect 5th, and thus antagonizes the natural key relationship, and is therefore relatively dissonant to the key—having the effect of a tone foreign to the key, and tending to induce change of key. Therefore, when thus used, it must be treated as a dissonance.

Rule II. *Dissonances tend to resolve down, unless by resolving up they can do so by a smaller interval (half-step instead of a whole step).* As a result of this rule, 7ths, 9ths, etc., diminished intervals, and perfect 4ths (when just over the bass) tend to resolve down, while leading tones and augmented intervals tend to resolve up.

10. In view of the tendency to maintain the key relationship, it is also a rule:

Rule III. *Dissonances tend to resolve by steps and half-steps of the diatonic scale of the key.* In a general sense, however, dissonances tend to move by half-steps as the smallest interval in use, and therefore by ignoring the key boundary they may easily be made to resolve chromatically into a new diatonic scale, or key, when by so doing a proper chord is formed in the new key.

11. **Rule IV.** *A dissonant tone should not be heard at the same time with the tone to which it resolves.* This rule generally causes the interval of a 2d to expand (its upper limit ascending or its lower limit descending). It is also the principal reason why the 7th descends, as otherwise it would resolve to the octave of the root (which is harmonically the same).

12. A chord to which a discord resolves is called its *chord of resolution*, and the note to which a dissonant tone resolves is called its *note of resolution*. If the resolution of a dissonant tone is retarded by one or more notes intervening, it is called an *ornamental resolution*.

13. Dissonant tones are pleasing if short, not too frequent, and properly resolved. Dissonant tones, by calling for resolution, express energy and progress, and therefore give vigor to the music.

14. In the extensions of the triad (chords of the 7th, etc.), the added tone or tones often form dissonant intervals with more than one tone of the triad (see p. 69); but it is only necessary to apply the rules of resolution to the dissonant

tone which is the cause of the several dissonant intervals, as the different tones of the triad are, in general, subject to the progression of the triad.

15. In the diminished and augmented triads (p. 67 : 3) the dissonant 5th will require resolution.

16. Applying the rules of resolution and progression to the Dominant 7th chord $\left(V_7, \frac{4}{2}\right)$: 7, being the leading tone of the key, ascends to 1; 4 (minor 7th) descends to 3; let 5 remain stationary and 2 ascend or descend (5 and 2 being free), and we have the Tonic chord. If we let 5 ascend to 6, we will have the Tonic chord of the relative minor (see Fig. 10, p. 43). If in the V_7 chord of the relative minor we let 5 ascend to 6, we have the IV chord of the relative major. These are the principal resolutions of the Dominant 7th (V_7) chord. Thus a dissonant chord may have several resolutions, owing to the free nature of some of its parts, the dissonant parts resolving the same in each case.

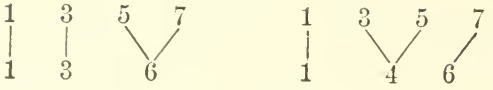
17. In a similar manner, the other dissonant chords may be resolved by applying the rules of resolution to the dissonant parts.

18. In the $\frac{6}{4}$ chord (2d inversion of a triad) the interval of a 4th being just over the bass tends to partake of the nature of a dissonance, and calls for resolution. The most satisfactory resolution of the $\frac{6}{4}$ chord is to the direct ($\frac{5}{3}$) chord on the same bass.

19. It is possible, though not so usual, instead of resolving the dissonant part, to hold it and bring the other parts, which form dissonant intervals with it, into consonant positions; or, which amounts to the same thing (in the case of the extended triad), we may either regard the lower three tones of the direct chord as the triad proper and the upper tone or tones as dissonant to be resolved (called treatment in the upper part), or we may regard the upper three tones (especially if forming a major triad) as the triad proper and the lower tone

or tones as dissonant to be resolved (called treatment in the lower part). Thus (taking the I_7 chord for example):

(Treatment in the upper part)



(Treatment in the lower part)

It will be noticed that the last two forms are symmetrically the reverse of the first two. In the first two, the upper note descends by reason of Rule IV; in the last two, the lower note ascends for the same reason.

20. These forms as general patterns show the most natural resolutions of all 7th chords, except the VII_7 and $\overline{VII}_7$, in which the root of the chord being the leading note ascends and the 5th (being diminished) and 7th descend, giving for their primary resolution the following form (see major and minor patterns):

21. As a general rule, the resolving parts resolve the same in all the different positions and inversions of chords, as the different positions and inversions are merely the same tones in different orders (counting octaves as replicates of the same tone).

22. The rules of progression and resolution are not to be regarded as absolutely binding at all times. They aim only at a smooth, connected, natural flow of music; therefore to express effort and excitement or any unusual effect they are temporarily set aside.

SUSPENSION AND ANTICIPATION

1. **Suspension** is the holding of a tone of one chord over into the next chord in which it is dissonant, thus producing a momentary discord.

2. **Anticipation** is taking a tone belonging to the following chord and holding it until the other parts follow (reverse of suspension).

3. The object of suspension and anticipation is the closer binding of chords by thus, in a sense, linking them together.

4. Three things are to be considered in suspension: its preparation, its entrance, and its resolution.

5. The general rule is: *The preparation takes place on an unaccented pulse; the entrance, on the following accented pulse; and the resolution, on an unaccented pulse—in other words, the entrance is accented; the preparation and resolution, unaccented.* The resolution may be ornamental (one or more notes intervening), and the chord accompanying the suspension may progress in the meantime to any chord containing the note of resolution.

6. The principal suspensions are: 9 to 8 (a suspended 9th resolving into the consonance of an octave), 4 to 3 (a suspended 4th resolving to a 3d), 7 to 8 (a suspended 7th resolving to an octave).

7. Suspension and anticipation may also be double or triple (occurring in two or three parts at the same time).

PASSING NOTES

1. Music is made up of Harmony notes and Passing notes. Notes belonging to a chord formation are called *Harmony* notes. Notes added to a triad forming chords of the 7th, 9th, etc., though dissonant, are included with harmony notes. Suspended and anticipated notes are merely harmony notes held over or taken in advance. These are all essential to the harmony and are classed as Harmony notes.

2. Notes used merely in passing from one harmony note

to another, but which do not belong to the prevailing chord, are called *Passing* notes. Notes used merely for embellishment (p. 30:6) are also classed as Passing notes.

3. Passing notes a 3d, 6th, or octave apart may be used simultaneously in different parts. The chords thus formed are called passing chords, being too transient to be harmonically recognized.

4. The true Passing note (used in passing from one harmony note to another) comes in and goes out without skip. Two passing notes are thus used in succession when the interval between the harmony notes requires. These increase the smoothness of the melodic flow, and for this purpose are freely used in music, especially in the melody part.

5. Other Passing notes come in by a skip and go out without skip. These are more of the nature of embellishing notes.

6. Other Passing notes come in without skip and go out by a skip of a 3d in the opposite direction (often going to another passing note, which latter, of course, belongs to the preceding class).

7. Other passing notes leave and return to the same harmony note. In this case, and also in the case where the passing note comes in by skip and goes out without skip, if the passing note is below the harmony note, it tends to a half-step below, thus often requiring an accidental ♯ or ♮ in writing it where the diatonic interval is not already a half-step. Before the 3d of a chord or the 3d or 5th of a V_7 chord, the passing note may be a whole step below.

8. Passing notes are not prepared; in short, are not bound by any of the laws of harmony except that being dissonant they require to be resolved.

PEDAL PASSAGE

1. A **Pedal Passage** is a passage in which the bass sustains the tonic or dominant (sometimes both), while the other parts move independently of it. The tone thus sustained is called the pedal point, or tone. The passage should begin

with the harmony of the pedal tone, frequently return to it, and finally end with it.

2. During the pedal passage, the part next above the pedal becomes the real base as to chord relations.

3. There should not be more foreign harmony in the passage than the pedal tone is capable of counterbalancing. The tonic and dominant (having the most sustaining power) are best adapted to form the pedal point.

4. If the sustained tone is held by one of the upper parts, it is called a *stationary* tone, and has not the sustaining power peculiar to the bass.

THE CADENCE

1. The **Cadence** is the close of a musical strain; its object is to form a satisfactory ending. It consists, in its regular form, of the Tonic as the final chord preceded either by the Dominant (V or V_7) or Sub-dominant chord; the first is called *Authentic;* the second, *Plagal.*

2. If the cadence ends with the Dominant or Sub-dominant, instead of the Tonic chord, it is called a *Half Cadence.*

3. The Authentic is the strongest and most common form of cadence. It is also called a *Perfect Cadence* when the final Tonic is in direct form and 1st position, thus having the root in both bass and soprano; otherwise, it is called an *Imperfect Cadence.*

4. A *Deceptive Cadence* is where the Dominant resolves to some other chord than the Tonic, thus deceiving our expectations.

5. The cadence is sometimes ornamented by runs, trills, etc., in which case it is usually called a *Cadenza.*

6. In music the notes are grouped into musical phrases, the phrases into musical clauses (called sections), the clauses into musical sentences (called periods). These are arranged rhythmically as in poetry. Every musical clause or sentence ends with some kind of cadence. The cadences should be varied, reserving the most complete cadence for the final ending.

7. In poetry or prose the divisions are shown by punctuation marks. In music the punctuation marks are not written, but are, in a sense, understood; thus a cadence calls for a semicolon, colon, or period (understood), according to its degree of completeness.

8. The phrases of a musical clause are separated from each other by a slight unwritten pause called a *caesura*, which in poetry is usually marked by a comma. This, however, does not, as a rule, involve a cadence.

SEQUENCE

1. A **Sequence** is a succession of similar movements.

2. A *Phrase Sequence* is a musical phrase repeated at a higher or lower pitch.

3. A *Chord Sequence* is a succession of similar movements of chords or groups of chords.

4. Symmetry is the controlling object in a sequence; therefore the rules of resolution are suspended when necessary to preserve the symmetry.

MODULATION

1. **Modulation** is passing from one key to another during the course of a piece of music. If the modulation is very brief, it is called a *digression*.

2. An accidental sharp (♯) or flat (♭) or natural (♮) usually means a change of key if a diatonic chord in a new key is thus formed. Sometimes, however, the accidental is only on a passing tone, and is called a chromatic tone.

3. An accidental necessarily introduces a new tone (foreign to the signature key), and therefore tends to lead to that key which contains the new tone while retaining as many tones of the old key as possible. As keys are related to each other in proportion to the number of tones they have in common, therefore the nearer two keys are related, the easier is the modulation from one to the other.

4. The Combined Key Table (p. 46) shows all the keys (major and minor) in the order of their relationship to each other; so that (in major keys) each key is related in the first degree to the nearest key on either side of it, and in the second degree to the second key from it on either side, etc. The connecting lines between the major and minor key tables show the order of relationship between major and minor keys.

5. Modulation from any major key to the next key on either side or to its relative minor is called natural modulation, because easy and natural (the keys differing by only one tone).

6. Modulation to a remote key is either gradual (when made by passing through the intermediate keys) or abrupt (when made by stepping over the intermediate keys). In any case, however, the general rule applies, that *the last sharp* (*whether in signature or as accidental—major or minor keys*) *is always on the 7th of the key* (*key letter, first letter above*); *and the last flat is always on the 4th of the key in major keys* (*key letter, fourth letter below*), *or on the 6th of the key in minor keys* (*key letter, third letter above*). This rule applies also to naturals by remembering that a natural has the effect of a flat in sharp keys, and the effect of a sharp in flat keys.

7. The rule already given for reading accidentals—giving a sharp effect to the key syllable by using *i* (ē), or giving a flat effect by using *e* (ā) or *ä* (see p. 21:23)—is the common rule, and the most convenient; this, however, is treating the accidentals as passing tones. It would be more correct, therefore, when a modulation occurs, to use the regular key syllables readjusted to the new key letter, returning to the signature key as soon as the modulation ends (usually at the end of the measure, unless the accidental is repeated in the next measure).

8. To illustrate the general principles of modulation, first find an accidental in a piece of music, then take the major

key table and start from the key in the table corresponding to the old key in the music, and at the point on the staff at which the accidental occurs in the music, pass horizontally (to the right in ♯'s, to the left in ♭'s) till you come to the ♯ or ♭ (treating a ♮ as a ♭, in sharp keys; and as a ♯ in flat keys); however, do not pass a 5 (to the right), as it will indicate the relative minor of that key; also, do not pass a 6 (to the left), as it will indicate the tonic minor of that key. If more than one accidental occurs in the music at the same time, take the first key that will satisfy them all; in which case, it will be observed that the last sharp or flat (which determines the new key) will be in the farthest key from the starting key.

9. It is evident that sometimes the accidentals involved in a modulation are not all marked in the music, as there may not always be notes on all of the affected lines or spaces to mark, but are understood if not marked; the last sharp or flat of any key necessarily involving all the other sharps or flats of that key.

10. When the modulation extends beyond the limits of the key table, we may continue around the circle (Fig. 9, p. 42) by making the enharmonic change (p. 42 : 13); but it is preferable, however, to extend the table in the direction of the modulation when doing so will occasion fewer accidentals in writing the music. Extending the table is merely for the purpose of avoiding the enharmonic change, and thus avoiding the accidentals which would be involved; but extending the table will involve double sharps or flats, as already shown (p. 52 : 41, 42)

11. In a harmonic sense, an accidental does not by itself produce modulation, but only when with other tones a diatonic chord of some other key is formed; the chord thus being a chromatic chord of the old key, but a diatonic chord of the new key; the modulation being the result of the tendency of chromatic chords to lead to the key in which they are diatonic, or natural.

METHODS OF MODULATION

1. There are many ways of modulating, but noticing a few principal methods will be sufficient to illustrate the general principles involved.

2. **Modulating by Means of Connecting Triads.** Examining the key table (p. 46) and comparing the triads of the different keys, we would find that all triads (except the augmented triad) are common to several keys (same tones though the triads have different names in the different keys). These may be called connecting chords, since they connect the keys.

3. It is evident that if a chord is common to any two keys it may resolve into either key. Therefore we may modulate from one key to another by first striking a chord common to both, then resolving it into a distinguishing chord of the new key.

$B^\flat$	$E^\flat$	f	$B^\flat$	c	F	g	C	d	G	a	D	e	A	b
		V			**V**		**I**		**IV**			**VI**		
			III		VI		II	I		IV				
							III		VI		II	I		IV
V			**V**		**I**		**IV**			**VI**				
				V			**V**		**I**		**IV**			**VI**
					III		VI		II	I		IV		
				VII°			VII°			II°				

Fig. 21.

4. Fig. 21 gives the triads of the key of C and the corresponding triads of each in other keys (though differing in name—roman numeral—yet composed of the same tones).

5. By similar comparisons, we would find that the triads of any other major key than C would have the same corresponding triads in other similarly related keys; so that the key letters at the top of Fig. 21 may be omitted, thus making the figure general in character, as it is applicable to all keys similarly related.

6. We notice also that the 1st, 4th, and 5th formulas (Fig. 21) are similar (composed of the same *major* triads in the same order); and that the 2d, 3d, and 6th formulas are similar (composed of the same *minor* triads in the same order). Now omitting the repetitions of the same formulas we would have Fig. 22.

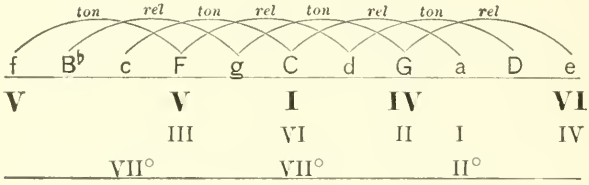
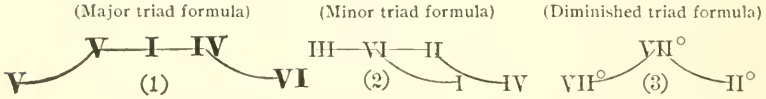


Fig. 22.

7. Making the figure general by omitting the key letters (since these formulas apply equally to any other keys similarly related), we will have three general formulas, which may be expressed thus:



(The curved lines compare with the curved lines in the key table, p. 46.)

Fig. 23.

8. These formulas may be copied (exact dimensions) and applied to the key table (between the major and minor keys) so as to show the keys related to any key through any given triad. By placing the given triad in line (vertically) with the given key (using the proper formula), the other triads will fall in line with the related keys (the roman numerals showing the relation of the triad to the different keys). As formulas 1, 2, and 3 are very simple, they can easily be applied mentally instead of applying a copy.

9. We may also observe that as every major key has three major triads (I, IV, V, p. 63 : 16) and every minor key has two major triads (V, VI), therefore every major triad is I, IV,

and V in three different major keys, and V and VI in two different minor keys (relationship shown by formula 1). As every major key has three minor triads (II, III, VI) and every minor key has two minor triads (I, IV), therefore every minor triad is II, III, and VI in three different major keys, and I and IV in two different minor keys (relationship shown by formula 2). Also, as every major key has one diminished triad (VII°) and every minor key has two diminished triads (II° and VII°), therefore every diminished triad is VII° in one major key, and II° and VII° in two different minor keys (relationship shown by formula 3).

10. Therefore, formulas 1, 2, and 3 cover the entire ground of modulation by common (or connecting) triads in both major and minor keys. Thus, if any major triad is struck in any key (major or minor) it may be regarded as belonging also to any one of four other keys related as shown in formula 1, and if any minor triad is struck in any key (major or minor) it may be regarded as belonging also to any one of four other keys related as shown in formula 2, and if any diminished triad is struck in any key (major or minor) it may be regarded as belonging also to either of two other keys related as shown in formula 3, the modulation depending entirely upon the resolution of the triad in each case.

11. To modulate beyond the reach of any one of the formulas, we may reach to any convenient key through one of the formulas (or any part of it), then move to another triad of same key, then, with the formula containing this new triad, reach (as before) to another convenient key, and so on until the desired key is reached.

12. To confirm the modulation (if not already confirmed), on reaching the desired key we should resolve to a distinguishing chord of this key. The distinguishing chord should include the 7th of the key when modulating in the direction of sharps (or the relative minor), or the 4th of the key (the 7th is also desirable, as it is the leading tone) when modulat-

ing in the direction of flats; since the last sharp is on the 7th and the last flat is on the 4th. The V_7 $\left(\frac{4}{5}\right)$ chord (containing both 4 and 7) is best adapted for this purpose.

13. Hence the rule: *A key is usually confirmed by some form of dominant harmony.* Other chords may lead to or introduce the new key.

14. The V_7 chord is a very restless chord and calls strongly for the Tonic (I) chord, the modulation not being completed until the Tonic, or chord of home feeling, is reached.

15. **Modulation by Means of Connecting Tones.** As already observed, keys are related to each other in proportion to the number of tones they have in common; by the same principle, chords (whether in the same key or different keys) are also related in proportion to the number of tones in common. These common tones are naturally connecting tones in passing from one chord to another (evidently, the more tones in common the less motion required).

16. A diatonic chord is one which does not require any change in the natural intervals of the key (involving only the sharps or flats of the signature); all others are called altered or chromatic chords.

17. There are only four kinds of diatonic triads in a key: the major triad (major 3d + minor 3d), the minor triad (minor 3d + major 3d), the dim. triad (minor 3d + minor 3d), and the aug. triad (major 3d + major 3d).

18. Observe that there are two ways of changing a triad of one kind into another kind—one by flats, the other by sharps—since moving one tone one half-step in one direction or moving the two other tones one half-step in the other direction will have the same effect on the intervals involved, but of course the modulation will be in opposite directions.

19. Thus, for example, we may change the major triad $\frac{3}{5}$ into a minor triad either by flatting the 3d or sharping the 1st and 5th, as $\frac{\flat 3}{5}$ or $\frac{\sharp 1}{\sharp 5}$. In either case we have changed

the intervals of the major triad (major 3d + minor 3d) into the intervals of the minor triad (minor 3d + major 3d). (See major pattern.) However, neither $\flat\frac{3}{5}$ nor $\sharp\sharp\frac{3}{5}$ is now a diatonic (but a chromatic) chord of the old key, but is a diatonic chord of a new key. As they are now minor triads they may each exist (under different names) in five different keys related as shown in formula 2, but the modulation would most naturally be to the one nearest related to the key from which we started. See key table and observe that if we start from $\frac{3}{5}$ in key of C major, then $\flat\frac{3}{5}$ will be $\flat\frac{6}{4}$ (II) in key of F, and $\sharp\sharp\frac{3}{5}$ will be $\sharp\sharp\frac{7}{3}$ (III) in key of E.

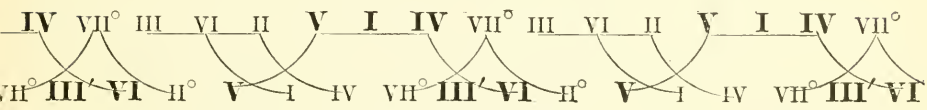


FIG. 24.

20. Formulas 1, 2, and 3 may be combined, as in Fig. 24, by repeating the formulas in order, thus forming an unbroken chain. The ends of the chain may be lapped, forming a circle (corresponding to the key circle). A copy of this combination will be found at back of book, which may be cut out and applied to the Combined Key Table to show the modulation effected by changing any triad of one kind into a triad of any other kind.

21. Thus, starting with the formula corresponding to the nature (major, minor, or diminished) of the given triad, and placing the given triad in line with the key we start from, then, if the change is by flats, the formula to the left corresponding to the nature of the changed triad will locate all the keys containing the changed triad. If the change is by sharps, the formula to the right corresponding to the nature of the changed triad will locate all the keys containing the changed triad. Though the modulation in either case leads

first to the key nearest related to the starting key (as differing by the fewest tones), yet the changed triad may be resolved into any one of the different keys in which it is common (as already shown in the method by connecting chords).

22. If the change is to an augmented triad, then III′ to the right or left (as the case may be) will locate the new key.

23. However, the principal chords used in modulation by connecting tones are the Dominant 7th (V_7) chord, in modulating in major keys and major to minor, and the Diminished 7th ($\overline{VII}^{\circ}_{7}$) chord, in modulating in minor keys and minor to major.

24. **Modulation with the Dominant 7th Chord.** The Dominant 7th (V_7) chord is peculiarly adapted for modulating purposes for several reasons.

25. *First*, the $V_7\left(\frac{3}{5}\right)$ chord contains the three key limiting points: 7 (toward the left), 4 (toward the right), and 5 (toward the relative minor). See key table (p. 46) and observe that we cannot move from 7 of any key to the left (on same degree of staff), nor from 4 to the right, nor from 5 to relative minor, without chromatic change; but all four tones of the chord may be moved to the tonic minor without change. Hence the V_7 chord limits the key in all directions except toward the tonic minor.

26. *Second*, the V_7 chord calls strongly for the Tonic chord (7 being the leading tone one half-step below 1, 4 being one half-step above 3, and 5 being a connecting tone).

27. *Third*, there is no other chord built like it (major 3d, perfect 5th, minor 7th), so that there is no other chord like it in the same key (the same V_7 chord is common only to one major key and its tonic minor—see formula 1). The V_7 chord, therefore, has a peculiar locating power and always calls for a certain major key or its tonic minor, whichever is nearest related to the key from which we are modulating.

28. It is evident that we can form the intervals of the V_7

chord on any tone of any key by using the necessary sharps or flats, and that each chord thus formed will be the diatonic V_7 chord of some key and will call for that key.

29. I_7 and IV_7 differ from V_7 only by the 7th being major instead of minor (see major key pattern), therefore I_7 and IV_7 can be changed to a V_7 either by flatting the 7th or by sharping the 1st, 3d, and 5th.

30. II_7, III_7, and VI_7 differ from V_7 only by the 3d being minor instead of major, therefore II_7, III_7, and VI_7 can be changed to a V_7 either by sharping the 3d or by flatting the 1st, 5th, and 7th.

31. VII°_7 differs from V_7 by the 3d being minor and the 5th being diminished, therefore VII°_7 can be changed to V_7 either by sharping the 3d and 5th or by flatting the 1st and 7th.

32. Thus we can form the V_7 chord in twelve different ways in any one key, each of which would be a diatonic V_7 chord in one of the twelve major keys and its tonic minor, and which would modulate to one of the major keys except where the tonic minor comes in first as being nearer related. (These chords would be chromatic chords viewed from the old key, but diatonic chords viewed from the new key.)

33. We may begin at any major key, but the key of C (being without sharp or flat) is the most convenient for purposes of comparison. Compare the following results by referring to the key table (p. 46).

34. Forming the V_7 chord on 1 by flatting the 7th, thus, $\begin{smallmatrix}\flat 7\\5\\3\\1\end{smallmatrix}$, we have the V_7 chord of the key of F or *f*, which therefore modulates to the key of F as being nearer related. Sharping the 1st, 3d, and 5th, thus, $\begin{smallmatrix}7\\\sharp 5\\\sharp 3\\\sharp 1\end{smallmatrix}$, we have the V_7 chord of $f\sharp$ or F$\sharp$, and modulation is to $f\sharp$ as being nearer related.

35. Forming the V_7 chord on 4, thus, $\begin{smallmatrix}\flat 3\\1\\6\\4\end{smallmatrix}$ or $\begin{smallmatrix}3\\\sharp 1\\\sharp 6\\\sharp 4\end{smallmatrix}$, we have the V_7 chords of B$\flat$ or $b\flat$, and *b* or B.

36. Forming the V_7 chord on 2, thus, $\frac{1}{6}_{4}^{2}$ or $\frac{\flat 1}{\flat 6}_{\flat 2}^{4}$, we have the V_7 chords of G or *g*, and G♭ or *g*♭.

37. Forming the V_7 chord on 3, thus, $\frac{2}{7}_{5}^{3}$ or $\frac{\flat 2}{\flat 7}_{\flat 3}^{5}$, we have the V_7 chords of *a* or A, and A♭ or *a*♭.

38. Forming the V_7 chord on 6, thus, $\frac{5}{3}_{1}^{6}$ or $\frac{\flat 5}{\flat 3}_{\flat 6}^{1}$, we have the V_7 chords of D or *d*, and D♭ or *d*♭.

39. Forming the V_7 chord on 7, thus, $\frac{6}{4}_{2}^{7}$ or $\frac{\flat 6}{4}_{\flat 7}^{2}$, we have the V_7 chords of *e* or E, and E♭ or *e*♭.

40. We have thus modulated to twelve different major or minor keys: the key (major or minor) given first in each case being nearest related to C.

41. If we had taken any other major key than C as a starting-point, we would have obtained similar results, the only difference being that we would have had to use naturals to sharp the flatted tones in flat keys, and to flat the sharped tones in sharp keys.

42. Observe, in the key table, that *a* minor (relative of C major) is nearer related to C by two tones (3d and 6th) than its tonic A major. Therefore, all the minor keys to the right of *a* are also nearer related by two tones (3d and 6th) than their tonic majors. The result will be similar if we start from any other major key than C. Therefore, in modulating with the V_7 chord we cannot go directly beyond the nearest two major keys to the right of the starting key, after which the modulation leads into the minor keys (being nearer related than their tonic majors); but toward the left the modulation leads to the major keys (being nearer related than their tonic minors). In either case the final modulation is determined by the resolution of the V_7 chord, which may resolve to the Tonic chord of either the tonic major or minor key.

43. Another method of modulating with the V_7 chord is

by resolving the V_7 chord of the old key directly into the V_7 chord of the new key by moving the tones that are not common each to the nearest tone of the new V_7 chord and using the common tones, if any, as connecting tones. Comparing the V_7 chords of the different keys (see key table) will show the moves necessary in each case.

44. We may also modulate by making a chromatic (half-step) run up to 7 or down to 4 of the desired key, then taking the rest of the V_7 chord of that key.

45. Observe (see Fig. 10, p. 43) that sharping the root (5) of the V_7 chord of the major key gives the $\overline{\text{VII}}^{\circ}_7$ (Diminished 7th) chord of the relative minor key. Also observe (Fig. 11, p. 44) that flatting the 7th (6) of the $\overline{\text{VII}}^{\circ}_7$ chord of the major key gives the $\overline{\text{VII}}^{\circ}_7$ chord of the tonic minor. Therefore, we may modulate to any minor key by first modulating to the V_7 chord of its relative major, then sharping the root (5)—by making both moves at the same time the modulation would be direct; or, first modulating to the $\overline{\text{VII}}^{\circ}_7$ chord of its tonic major, then flatting the 7th (6)—or direct, by making both moves at the same time. The two methods when direct (in one move) are necessarily the same, as they result in the same chord—Diminished 7th ($\overline{\text{VII}}_7$) of the minor key.

46. **Modulation with the Diminished 7th ($\overline{\text{VII}}^{\circ}_7$) Chord.** This chord is also peculiarly adapted for modulating purposes for several reasons.

47. *First*, it is only found as a diatonic chord in minor keys (on the 7th), and therefore calls for a minor key.

48. *Second*, it contains all four of the key limiting points of minor keys (see pp. 47: 17–48: 18); 7 and 4 from the tonic view, and 2 and 6 from the relative view. Observe, from the key table, that we cannot move (on same degree of staff) from 7 either to the right or left, nor from 4 to the right, nor from 2 to the left, nor from 6 to the right, nor from 7 to relative major, nor from 6 to tonic major, without chromatic changes. So that the $\overline{\text{VII}}^{\circ}_7$ chord limits the key in

all directions (toward the right by 7, 4, and 6, toward the left by 7 and 2, toward the relative major by 7, toward the tonic major by 6).

49. *Third*, it can easily be converted into a V_7 chord.

50. *Fourth*, no other chord is built like it (minor 3d, dim. 5th, dim. 7th), so there is no other chord like it in the same key.

51. *Fifth*, three of its members are capable of an enharmonic change, each change converting it into the same chord of another key. (Modulation by means of enharmonic changes is called *enharmonic modulation*.)

52. Comparing any minor key with its relative and tonic majors (see key table), we will see that the $\underline{\text{VII}}^{\circ}_{7}$ chord of any minor key can be changed into the V_7 chord of its relative major by simply lowering the root (7) one half-step (see Fig. 10, p. 43), or into the VII° chord of its tonic major by raising the 7th (6) one half-step (see Fig. 11, p. 44). Thus we have a simple method of modulating from any minor key to its relative and tonic majors, and *vice versa*.

53. By referring to the minor key pattern we see that the $\underline{\text{VII}}^{\circ}_{7}$ chord is made up of three minor 3ds, one above the other, and that the augmented 2d between 6 and 7 (the extremes of the chord, harmonically speaking) is equal to a minor 3d ($1\frac{1}{2}$ steps). Therefore the $\underline{\text{VII}}^{\circ}_{7}$ chord is practically a circle of minor 3ds, and the aug. 2d may take the place of any one of the minor 3ds without affecting the tones, though causing a refiguring of the tones, since the aug. 2d must come between 6 and 7, and involving also an enharmonic change in one or two of its members.

54. We observe also (from relative minor pattern) that three of the members of the $\underline{\text{VII}}^{\circ}_{7}$ chord are capable of an enharmonic change (change of name without change of tone); thus, ♯7 to ♭1, 2 to ♭3, and 6 to ♯5. Applying these changes to the $\underline{\text{VII}}^{\circ}_{7}$ chord, we would have $\overset{6}{\underset{\sharp 7}{\overset{4}{2}}}$, $\overset{6}{\underset{\flat 1}{\overset{4}{2}}}$, $\overset{6}{\underset{\flat 1}{\overset{4}{\flat 3}}}$, and $\overset{\sharp 5}{\underset{\sharp 7}{\overset{4}{2}}}$ (in each

case changing a minor 3d to an aug. 2d), but the last three will have to be refigured, so that the aug. 2d will come between 6 and 7; this would give $\overset{6}{\underset{\sharp 7}{4}}$, $\overset{4}{\underset{\flat 6}{2}}$, $\overset{2}{\underset{\flat 4}{7}}$, and $\overset{\sharp 7}{\underset{\sharp 2}{6}}$. Thus we have the $\underline{\text{VII}}^{\circ}_{7}$ chord in four different minor keys (made up of common tones, though involving different accidentals in writing it in the different keys). If the first key is *a* minor, the second will be *c* minor, the third $e\flat$ minor, and the fourth $f\sharp$ minor. (The $\underline{\text{VII}}^{\circ}_{7}$ of tonic minor would give similar results).

55. We may observe that every third minor key (see minor key table, p. 46) is thus related through the common $\underline{\text{VII}}^{\circ}_{7}$ chord, and also that these same keys are linked together through their majors (the relative major of one being the tonic major of the next, etc.).

56. In this sense the $\underline{\text{VII}}^{\circ}_{7}$ chord, like the major, minor, and dim. triads, is an equivocal chord because it does not point to any particular key, since it may resolve into the Tonic chord of any one of four different minor keys (the modulation depending on the resolution in each case).

57. The $\underline{\text{VII}}^{\circ}_{7}$ may evidently be regarded as the V_9 chord, with root omitted, of a minor key (see p. 72 : 22), thus being classed as dominant harmony, and therefore included in the rule that *a new key is usually confirmed through some form of the Dominant.*

58. Observe, from the key table, that in resolving the $\underline{\text{VII}}^{\circ}_{7}$ chord of one key to the $\underline{\text{VII}}^{\circ}_{7}$ of the next key to the right, we raise each tone one half-step; or to the $\underline{\text{VII}}^{\circ}_{7}$ of the next key to the left, we lower each tone one half-step—there being no connecting tone.

59. It is evident that the intervals of the $\underline{\text{VII}}^{\circ}_{7}$ chord are the same in its several positions and inversions, since the members are all equidistant.

60. By combining the several methods of modulation by the $\underline{\text{VII}}^{\circ}_{7}$ chord, we may modulate from any key to any other. Thus, beginning at any minor key, we may modulate to any

minor key having the $\underline{\text{VII}}^{\circ}_{7}$ common by simply resolving it to the Tonic chord of the desired key, or to any other minor key by first resolving it to the $\underline{\text{VII}}^{\circ}_{7}$ of the next key (right or left), then resolving to the Tonic of the desired key, or to any major key by changing the $\underline{\text{VII}}^{\circ}_{7}$ chord (before resolving to the Tonic) to the V_7 of its relative major or the VII°_{7} of its tonic major; or, beginning at any major key, by first changing the VII°_{7} of the tonic major or the V_7 of the relative major to the $\underline{\text{VII}}^{\circ}_{7}$ of the minor, then proceeding as above indicated. We make the modulation abrupt (direct), in any case, by making the different moves at the same time.

61. Beginning at the major key of F♯, we may take its VII°_{7} chord and make natural the 7th (6), which gives the $\underline{\text{VII}}^{\circ}_{7}$ of its tonic minor *f*♯, then with the common $\underline{\text{VII}}^{\circ}_{7}$ (by making the proper enharmonic changes) we may step over to *e*♭ minor, then flatting the root (7) we have the V_7 of its relative major G♭; thus we have modulated from F♯ to G♭. But these keys are equivalent (interchangeable) keys; therefore, by using the extreme limit of our means of modulation, we have modulated entirely around the key circle to the starting-point; or, in fact, we have not modulated at all, but simply made the enharmonic change and moved from VII°_{7} to V_7 of equivalent key.

62. It is evident that we cannot modulate to advantage, in either direction or by any means, farther than half-way around the key circle, as it is then nearer to modulate in the opposite direction; and, for the same reason, if we extend the table to avoid the enharmonic change, we cannot modulate to advantage farther than the equivalent of half-way around the circle, as extending the table is merely adding overlapping keys in the key circle.

63. **Modulation with the Augmented 6th Chord.** The *Augmented 6th* chord is a chord containing the interval of an aug. 6th (5 steps). It is used in three forms, called Italian 6th, French 6th, and German 6th.

64. The Italian 6th chord consists of a major 3d and aug. 6th; thus, $\sharp\frac{4}{1}_{6}$ (in minor key). The French 6th consists of a major 3d, aug. 4th, and aug. 6th (same as Italian 6th, with aug. 4th added); thus, $\sharp\frac{4}{2}_{6}\,1$ (in minor key). The German 6th consists of a major 3d, perfect 5th, and aug. 6th (same as Italian 6th, with perfect 5th added); thus, $\sharp\frac{4}{3}_{6}\,1$ (in minor key). If we omit the 5th in the German 6th, we have the Italian 6th; or if we change the 5th to an aug. 4th, we have the French 6th.

65. The thorough-bass figuring of the Italian 6th is $\sharp 6$, of the French 6th is $\sharp\frac{6}{4}_{3}$, of the German 6th is $\sharp\frac{6}{5}$. These chords are only used in direct form.

66. The Italian 6th is a three-toned chord, but in forming four-part harmony the 3d only must be doubled.

67. Observe that the intervals of an aug. 6th and minor 7th are equal. Therefore the German 6th and V_7 chords are composed of the same intervals (as to measure), and one can be converted into the other by enharmonically changing one member; but the two chords resolve differently—the aug. 6th ascends, while the minor 7th descends.

68. The Italian 6th, French 6th, and German 6th, being dissonant chords, require resolution. The primary resolution of each is the same (V, with root doubled), and therefore (to save space) may be treated together. Thus, $\sharp\frac{4}{3}_{6}\,1$ (2) resolves into $\sharp\frac{5}{2}_{5}$ (minor key). It will be seen (see minor pattern) that the 6th ($\sharp 4$) ascends one half-step to 5, and the other three members descend each one half-step. In the case of the Italian 6th—the 5th (3) being omitted—the 3d (1) may either descend one half-step to $\sharp 7$ or ascend one step to 2 (or if the 3d is doubled, it may take both parts). In the case of the French 6th the 4th (2) will remain stationary.

69. In the case of the German 6th, if the 1st and 5th both descend one half-step at the same time, we would have con-

secutive 5ths. To avoid this we may retard the resolution of the 3d and 5th until after the other parts resolve $\left(\begin{smallmatrix}\sharp 4\\ 3\\ 1\\ 6\end{smallmatrix}, \begin{smallmatrix}5\\ 3\\ 1\\ 5\end{smallmatrix}, \begin{smallmatrix}5\\ \sharp 2\\ \sharp 7\\ 5\end{smallmatrix}\right)$, thus forming the $\frac{6}{4}$ (2d inversion) of the minor Tonic between; or the 5th may ascend one half-step $\left(\begin{smallmatrix}\sharp 4\\ 3\\ 1\\ 6\end{smallmatrix}, \begin{smallmatrix}5\\ \sharp 4\\ 1\\ 5\end{smallmatrix}, \begin{smallmatrix}5\\ \sharp 2\\ \sharp 7\\ 5\end{smallmatrix}\right)$, forming the $\frac{6}{4}$ of the major Tonic between; or we may preresolve the 5th $\left(\begin{smallmatrix}\sharp 4\\ 3\\ 1\\ 6\end{smallmatrix}, \begin{smallmatrix}\sharp 4\\ \sharp 2\\ 1\\ 6\end{smallmatrix}, \begin{smallmatrix}5\\ \sharp 2\\ \sharp 7\\ 5\end{smallmatrix}\right)$, forming the French 6th between.

70. The natural seat of the aug. 6th (It., Fr., or Ger.) chord is on the 6th of a minor key. as only in that position is it in the same key with its chord of resolution, as will be seen by trying it on all the degrees of the major and minor patterns.

71. The aug. 6th chord is often used merely as a chromatic chord, but when used as a means of modulation it naturally leads to that minor key where it is based on the 6th of the key and is immediately confirmed by its chord of resolution. (In the aug. 6th chord the last sharp is on the 4th of the new key and is an exception to the rule that the last sharp is always on the 7th of the key.)

72. Since the German 6th and the V_7 chords may be enharmonically changed the one into the other, they may, in a sense, be regarded as a common chord of different keys, the modulation being determined by its resolution. Observe, from the key table, that the German 6th chord of any minor key, as (for example) *a* minor, is composed of the same tones (enharmonically changing the 6th to a 7th) as the V_7 chord of the key of B♭ major (or its tonic *b*♭ minor). Therefore, in enharmonically changing a German 6th to a V_7 chord, we modulate from a certain minor key to the second key to the left of its relative major, or conversely, when enharmonically changing a V_7 to a German 6th chord.

Modulation by Inversion. (See p. 120.)

Modulation by Imitation. (See p. 125.)

SUMMARY OF MODULATION

1. The diatonic tones of any key are its natural tones unaffected by accidentals (involving only the sharps or flats in the signature), except the 7th in minor keys, which is diatonic, though marked by an accidental.

2. If a diatonic tone of a key is chromatically altered by an accidental, it is called a chromatic or altered tone. A tone may be chromatic in one key and diatonic in another. As already observed (p. 92 : 11), an accidental does not always produce a change of key, as it may sometimes indicate only a chromatic passing tone or chord.

3. A *diatonic chord* (p. 96: 16) is one that contains only diatonic tones. A *chromatic chord* is one that contains one or more chromatic tones. A chord may be chromatic in one key and diatonic in another. A modulating chord containing accidentals is a chromatic chord as viewed from the old key, but a diatonic chord as viewed from the new key; and modulation is only the natural result of a chromatic chord calling for that key in which it is a diatonic or natural chord. If a chromatic chord does not follow up its suggestion of a new key, but returns immediately to a distinguishing chord of the old key, it should be regarded merely as a chromatic chord of the old key.

4. Sometimes a chromatic chord is followed by another chromatic chord, the two suggesting keys in opposite directions, in which case they counteract each other and no modulation is produced.

5. We see, therefore, that an accidental does not always produce modulation. On the other hand, modulation sometimes takes place without an accidental or some distance in advance of the accidental (or sign of the new key), as modulation takes place whenever the home-feeling changes to a new tonic, whether an accidental occurs at that point or not; but in most cases the modulation will sooner or later be confirmed by the appearance of the accidental. (This will be referred to again under Modulation by "Inversion," and by "Imitation.")

6. It is evident, especially between any two closely related keys where the tones are nearly all common, that the music may continue some distance on chords common to both keys; the music being, as it were, on a balance between the two keys, so that a slight cause or suggestion (or even a slight mental effort) may turn the balance without necessarily involving an accidental. Therefore, the new key may be taken at any convenient point (when the music is thus on common ground), as, for instance, the beginning of a line of words, or the beginning of a musical phrase or figure, or any other natural division of the music, or after a rest, or when the arrangement of tones or chords seems to suggest the new key.

7. There may be three stages of modulation—the new key being first suggested, then confirmed, then completed. The suggestion and confirmation may or may not take place at the same time. We accept the new key when first suggested, but the suggestion must sooner or later be confirmed, usually by some form of Dominant harmony of the new key; we are still not at home in the new key till we reach the Tonic, or chord of home-feeling, thus making a complete cadence in the new key.

8. If a modulation is very short and incomplete it is called a *transient* modulation or merely a *digression;* but if a complete cadence (Dominant followed by Tonic harmony) is made in the new key, it is called a *cadential modulation.*

9. Modulation may be classified as follows:

Modulation Classified.

As to Distance	Natural (to a closely related key). Remote (to a distant key).
As to Manner	Gradual (passing through the intermediate keys). Abrupt (stepping over the intermediate keys).
As to Means	Diatonic (by means of common chords). Chromatic (by means of chromatic chords). Enharmonic (by means of enharmonic changes).
As to Completeness	Digressive (when short and incomplete). Cadential (when making a complete cadence in the new key).

10. Duration, location, the form and position of the Dominant and Tonic chords, the place in rhythm, etc.,—all have a bearing on the importance of a modulation.

11. The different methods of modulation already explained bear only on the question of "How to modulate." "When to modulate" is an equally important question.

12. The art of modulating does not consist merely in the ability to ramble through various keys, but consists in knowing when, as well as how, to modulate.

13. The purpose of modulation is to enlarge the means of musical expression by placing the combined harmonies of all the keys at our disposal instead of confining us to the limits of one key.

14. We may enter a new key whenever the old key proves insufficient to produce the musical effect we wish; also, to avoid too much uniformity (especially in the longer pieces of music), and to secure variety and contrast. Just as dissonances heighten by contrast the effect of consonances, so modulation heightens by contrast the sense of key tonality; but either should be used only when it gives a sense of justification in the effect produced. Modulation should thus be the result of necessity rather than a display of skill.

15. Our sense of symmetry and proper balance requires that the music should end in the same key in which it begins; otherwise, it would seem incomplete.

TRANSPOSITION

1. As already seen, modulation consists in passing from one key to another during the course of the music, thus involving only accidentals. On the other hand, *transposition* consists in moving the entire music bodily into another key, thus involving a new signature. However, if the transposition be by the interval of an octave, the signature (and therefore the key) will not be affected, since the scale is not changed. But if the transposition be by any other interval than the

octave, the music will evidently be in a different scale, or key, requiring the corresponding signature.

2. Music may be transposed, or moved bodily, to any key exactly as the key pattern (Chart I.) may be moved bodily to any key (the music being made up of key tones). And as moving the key pattern does not affect the relation of the key tones to each other, so transposition does not affect the interrelationship of the tones of the music. Transposition, therefore, is merely a change of pitch of the entire music.

3. Any modulations of the music before it is transposed will, after it is transposed, be similarly related to the new key as formerly to the old, and involving therefore the same accidentals.

4. Writing the transposed music will evidently involve both a new signature and the raising or lowering (as the case may be) of each note on the staff a distance equal to the interval of transposition.

5. Transposition does not affect the reading of music nor the figuring of chords, as each note has the same position (and therefore the same key syllable name and numeral) in the new key as formerly in the old, the entire music remaining intact though in a new key.

6. Music may be transposed in the singing or playing of it without rewriting it. As the reading of the music is not changed, it is only necessary, therefore, to apply the key syllables or numerals with the key-note pitched to the desired key.

7. When several persons sing together it is necessary that they use the same key; but when a person sings alone the music may be pitched in any key that best suits his voice, regardless of the key in which it is written. In singing, the key is merely a question of pitching the voice at the start, the music naturally following in the key thus established.

8. In a similar manner, playing on the keyboard in a different key from that in which the music is written consists

merely in moving the key-note to the right or left (as the case may be) and playing the music accordingly with reference to the new key-note. This will involve both reading and playing the music with reference to the syllable or numeral name of each note regardless of its degree on the staff. A study of Chart II. (at back of book), by moving the key pattern to the different keys and remembering that the pattern represents the music to be transposed, will make the principle clear.

9. Each position of the pattern shows the white and black keys used in playing in that key. In playing in the key of C, only white keys are used, and the only difference in playing in other keys is that certain black keys are substituted for the white keys to the right or left (according as the music is in flats or sharps), and therefore requires a mental note of what keys are thus substituted. Also, E and F, and B and C are, in certain keys (with six or seven sharps or flats in signature), substituted for each other, as explained on p. 34 : 21.

10. We may also observe that each interval includes a certain number of finger-bars (taking the white and black successively), and that the same interval includes the same number of finger-bars at any place on the keyboard, and therefore the same hand-span spans the same interval at any place on the keyboard. This involves the development of what is called the "sense of location," by which one may unconsciously measure the intervals on the keyboard by hand-spans, just as in singing he unconsciously measures the intervals by their key tonality or mental effect.

11. Transposition to the tonic minor involves merely the flatting of the 3d and 6th of the key, but transposition to the relative minor involves lowering the entire music a minor 3d and sharping the 7th of the key.

COUNTERPOINT

1. **Counterpoint** (meaning the point opposite or counter) refers to writing notes (formerly called points) opposite or counter to others, or the art of writing music in parts.

2. *Harmony* is the accompaniment of melody or tune with chords, while *counterpoint* is a combination of melodies, or an accompaniment of melody with melody, the chief aim in counterpoint being to give a melodic flow to each part.

3. Counterpoint is much older than harmony, and therefore precedes harmony from the view of priority; however, the same general principles are involved in both, which are most naturally treated under harmony, for which reason harmony is usually treated first.

4. The earliest part-music consisted of melody accompanied in the octave, 5th, or 4th. In time, the singers began to vary the monotony of these intervals by adding (extemporaneously) what are now called passing notes. It was also discovered, about this time, that several independent melodies could be sung together with good effect by adapting them to each other in rhythm and pitch and making slight changes where the dissonances were too apparent. The popularity of these new methods naturally led musical composers to combine the principles involved by adding melodic parts to their principal melodies (also to existing melodies), hence the origin of counterpoint.

5. At first the whole interest was centered in the melodic movement of the parts, the harmony being merely the incident result of avoiding dissonances. On the other hand, in modern harmony the whole interest (aside from the single melody) is centered in the harmonic combination of tones.

6. Naturally the highest development of music is in the combination of these two elements of interest, or the harmonic combination of melodies. Counterpoint must therefore conform both to the requirements of melody and to the requirements of harmony.

7. Counterpoint may be outlined as follows:

- **Counterpoint.**
  - **Simple (non-invertible).**
    - Analysis
      - Subject (or *Cantus Firmus*).
      - Added part or parts (the counterpoint proper).
    - Species
      - 1st species (one note of the counterpoint to each note of the C. F.—note against note).
      - 2d species (two notes of the counterpoint to each note of the C. F —two against one).
      - 3d species (four notes of the counterpoint to each note of the C. F.—four against one).
      - Syncopated (each note of the counterpoint syncopated with each note of the C. F.).
      - Florid (a mixture or combination of the foregoing species).

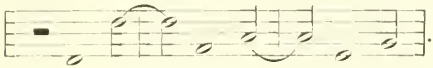
(Inversion means the upper part placed below or the lower part above.)

  - **Invertible.**
    - Classes
      - Double (two parts which also make correct music when inverted).
      - Triple (three parts which also make correct music in any order).
      - Quadruple (four parts which also make correct music in any order).
      - Manifold (any greater number of invertible parts).
    - Interval of Inversion
      - Inversion in the octave.
      - Inversion in the 9th (octave + 2d).
      - Inversion in the 10th (octave + 3d).
      - Inversion in the 11th (octave + 4th).
      - Inversion in the 12th (octave + 5th).
      - Inversion in the 13th (octave + 6th).
      - Inversion in the 14th (octave + 7th).
      - Inversion in the 15th (double octave).

8. In **Simple Counterpoint** a melody—called the subject or *cantus firmus*—is taken, to which one or more melodic or flowing parts are added, the part or parts thus added being called the *counterpoint*.

9. The *cantus firmus* may be in any part, and therefore the counterpoint may be written above the *cantus firmus*, or below, or both.

10. Simple counterpoint includes five species. In the

first species one note is written in the counterpoint to each note of the *cantus firmus;* thus, , called note against note. In the second species, two notes are written in the counterpoint to each note of the *cantus firmus,* thus, , called two against one. (In triple time three notes are written against one—the notes of the *cantus firmus* being dotted.) In the third species, four notes are written in the counterpoint to each note of the *cantus firmus,* thus, , called four against one. (In triple time six notes are written against one—the notes of the *cantus firmus* being dotted.) In *syncopated* counterpoint two notes are written to each note of the *cantus firmus,* but syncopated, or tied over, thus,  . In *florid* counterpoint any or all of the foregoing species are combined. When more than one part is added, they may be of different species.

11. In counterpoint, as in harmony, each combination of tones (except passing tones) represents some definite chord (complete or incomplete). All intervals are classed as concords or discords, the concords being the octave and perfect 5th (called perfect concords), and major and minor 3ds and 6ths (called imperfect concords). All other intervals are treated as discords, including the perfect 4th when between the lowest and one of the upper parts (see foot-note, p. 83).

12. **Contrapuntal Rules.** Contrapuntal music was originally for vocal performance; and the rules of counterpoint were for the purpose of making the parts easily singable, as well as to avoid disagreeable effects. Progressions that were found to be awkward or difficult for singers to take in connection with other voices, or combinations that produced dis-

agreeable effects, were naturally forbidden—hence the origin of the rules.

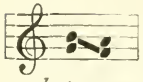
13. In modern counterpoint the rules are not so rigidly observed, as the ears of modern singers are more accustomed to dissonant chords; while in instrumental counterpoint the players are not dependent on the guidance of the ear. However, the influence of the rules is always beneficial.

14. (1) *In strict counterpoint of the first species (note against note) only consonant combinations should be used, as consonant combinations are easier to sing than dissonant ones, as well as more agreeable.* When two or more notes are written against one, a consonant combination may change conjunctly (without skip) into a dissonance, as a dissonance thus taken is not difficult to intone.

15. (2) *Accented pulses should, as a rule, be consonant and so far as possible complete chords, while unaccented pulses may be either consonant or dissonant. In syncopated counterpoint the first note of each syncopation must be consonant, the second note being either consonant or dissonant.* The rules for the resolution of dissonances (pp. 83, 84) are applied.

16. (3) **Skips.** *Consonant intervals are free to move by skips. Dissonant intervals should, as a rule, be approached and quitted without skips.* A skip from a discord on an unaccented pulse to a concord—called a changing tone—is sometimes used. Concordant skips (3ds, 6ths, perfect 4ths, perfect 5ths, and octaves) are freely used. Discordant skips (7ths, augmented and diminished intervals) should be avoided. A succession of wide skips (or more than two skips—even of a 3d) in the same direction should be avoided. After using three or four notes alphabetically a skip, even of a 3d, in the same direction should be avoided; but the skip may be made at the beginning of the passage.

17. (4) **The Tritone** (aug. 4th = 3 steps). This interval occurs naturally between the 4th and 7th of major and minor keys (see major and minor patterns). *It is not only to be avoid-*

ed as a skip, but also between parts of successive chords, thus,  ; *or between parts of chords on successive accents; or between the first and last notes of an ascending or descending passage, thus,* .

18. (5) **Consecutives.** *Similar perfect concords (octaves and perfect 5ths) should not occur successively nor on successive accents, especially between outside parts. The same applies, though less rigidly, to hidden consecutives* (p. 81 : 24). *Two successive major 3ds (unless taken by a half-step, as on the 5th and 6th of minor keys—see minor pattern) should be avoided. Successive 3ds and 6ths should, so far as possible, be alternately major and minor.*

19. (6) **False Relations.** *False relations should be avoided* (p. 81 : 26, 27).

20. (7) **Doubling.** *Double major 3ds should be avoided, especially on the accents. The same applies less rigidly to the 6ths and minor 3ds. Doubled leading notes should especially be avoided.*

21. (8) **Unison.** *The unison may occur in the first and last chords and occasionally on unaccented pulses, but should be used sparingly.*

22. (9) **Crossing.** *The parts may occasionally cross for the sake of a more melodious flow, but should not cross on the accent.*

23. (10) **Pedal.** *Pedal passages* (p. 88) *are occasionally used.*

24. (11) **Sequence.** *Sequences* (p. 90) *are always effective, and may be freely used.*

25. (12) **Modulation.** *Modulation to closely related keys is not restricted.*

26. (13) **Motion.** *Oblique and contrary motion* (p. 81 : 28) *should be used as much as possible, thus giving more individu-*

ality to the parts and lessening the liability to faults. All the parts should rarely move in the same direction at the same time.

27. Faults are less observed between inside parts or between inside and outside parts, also on unaccented pulses, and also as the parts increase in number. On the other hand, increased number of parts necessitates increased freedom of movement to secure the necessary flow to all the parts. Therefore, rules are less rigidly applied as the parts increase in number, or between inside parts, or between inside and outside parts, or on unaccented pulses.

28. **Double Counterpoint** consists of two invertible and equally important parts.

29. The following table shows the intervals of inversion, and the intervals within each and their inversions.

TABLE OF INVERSIONS

Inversion in octave	1 2 3 4 5 6 7	8—intervals
	8 7 6 5 4 3 2	1—inversions
Inversion in the 9th	1 2 3 4 5 6 7 8	9—intervals
	9 8 7 6 5 4 3 2	1—inversions
Inversion in the 10th	1 2 3 4 5 6 7 8 9	10—intervals
	10 9 8 7 6 5 4 3 2	1—inversions
Inversion in the 11th	1 2 3 4 5 6 7 8 9 10	11—intervals
	11 10 9 8 7 6 5 4 3 2	1—inversions
Inversion in the 12th	1 2 3 4 5 6 7 8 9 10 11	12—intervals
	12 11 10 9 8 7 6 5 4 3 2	1—inversions
Inversion in the 13th	1 2 3 4 5 6 7 8 9 10 11 12	13—intervals
	13 12 11 10 9 8 7 6 5 4 3 2	1—inversions
Inversion in the 14th	1 2 3 4 5 6 7 8 9 10 11 12 13	14—interval
	14 13 12 11 10 9 8 7 6 5 4 3 2	1—invers.
Inversion in the 15th	1 2 3 4 5 6 7 8 9 10 11 12 13 14	15 —int.
	15 14 13 12 11 10 9 8 7 6 5 4 3 2	1 —inv.

30. Observe that any interval added to its inversion is one greater (the central note on which the inversion turns being counted twice) than the interval in which the inversion is to be made. This suggests how the inversion of any interval may readily be found.

31. In the above table the dissonant intervals are marked with a stroke over, thus, —. Observe that in the *octave* all consonant intervals invert into consonant intervals and dissonant intervals into dissonant intervals, except 4 and 5; the same in the *10th* without any exceptions; the same in the *12th*, except 6 and 7; and that the *15th* (double octave) corresponds to the octave (11ths and 12ths being compound 4ths and 5ths). These are the intervals of inversion most used. It will be seen that the others invert so contrary as to give less satisfactory results.

32. Two parts intended for inversion should not at any point exceed the compass of the interval of inversion; otherwise, the parts will cross when inverted (the portion in excess remaining on the same side as before inversion, and therefore not inverted but merely contracted). Likewise, the two parts intended for inversion should not cross at any point, as the reverse of the above will happen when inverted (the portion crossed expanding instead of inverting). Therefore, the greater the interval of inversion, the greater the range allowed to the parts. It is evident that when parts are inverted as a whole, each interval between corresponding notes is inverted according to the interval of inversion.

33. Special attention must be given to those intervals that invert contrary (as regards consonance), the other intervals practically taking care of themselves (if forming correct progressions, the inversions naturally forming correct progressions also). Consonant intervals that invert into dissonant intervals must therefore be treated as dissonant as regards preparation and resolution, the treatment, however, being in the lower part, which becomes the dissonant part when in-

verted. Thus, in the *octave* the perfect 5th, though consonant, inverts into the perfect 4th, which is dissonant, and requires resolution and usually preparation, especially on the accent; the perfect 5th must therefore conform to the same requirements (in the lower part) in order to form correct progression when inverted. The same applies to inversion in the *12th* as regards the 6th and 7th; however, Dominant 7ths and Diminished 7ths do not usually require preparation (see p. 82 : 30).

34. It should be observed in the *10th* that consecutive 3ds and 6ths must be avoided, as they become consecutive octaves and 5ths in the inversion. Also, if these intervals are approached by similar motion, objectionable hidden octaves and 5ths are apt to occur in the inversion. It is apparent, therefore, that oblique and contrary motion must generally be employed.

35. In the *12th*, 3ds invert into 10ths and *vice versa;* these intervals, therefore, may freely be used even in similar motion; but for the other intervals oblique and contrary motion will generally be found necessary.

36. In the other intervals of inversion (9th, 11th, 13th, and 14th, which are but little used) it is evident that conjunct movement (without skip) will generally be necessary so that every discord may be approached and quitted conjunctly.

37. To more closely analyze the intervals and their inversions, see Fig. 25. Each diagram represents a section of the major key pattern, in which the major intervals are measured from each end (the natural intervals upward from 1 of major pat-

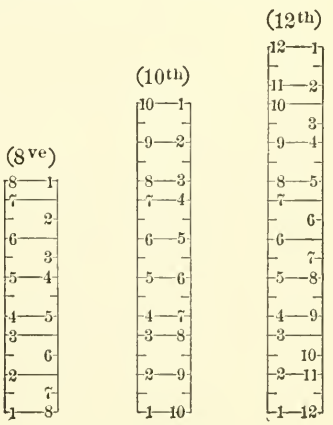


Fig. 25.

tern are taken as the standard and called major; see p. 56 : 2).

38. Observe that in the *octave* perfect intervals invert into perfect intervals, major into minor, and *vice versa*, and diminished into augmented, and *vice versa*.

39. Observe that in the *10th*, major intervals invert into major intervals (including the perfect intervals, which are sometimes called major), minor intervals (including the diminished perfects, which are sometimes called minor) invert into augmented intervals, and *vice versa*. The other diminished intervals, being equivalent by enharmonic change to major or perfect intervals, invert accordingly; thus, the diminished 7th, being equivalent to a major 6th, inverts into a perfect 5th (otherwise a double-augmented 4th, which is not a classified interval).

40. Observe that in the *12th*, 3ds, 6ths, 7ths, and 10ths invert as in the octave (major into minor, and *vice versa*, augmented into diminished, and *vice versa*), while the other intervals invert as in the *10th*.

41. Inversion in the *15th* (double octave) is practically the same as in the octave.

42. The other intervals of inversion may be analyzed in a similar manner.

43. It is evident that inversion may sometimes involve augmented and diminished intervals, which are usually chromatic. The available augmented and diminished intervals (p. 57 : 11) are the aug. 2d, aug. 4th, aug. 5th, and aug. 6th, and the dim. 5th and dim. 7th. The aug. 6th cannot be used in the octave, as it inverts into the dim. 3d. Of course these intervals are dissonant, and usually require treatment, and also involve accidentals which tend to induce modulation.

44. **Modulation by Inversion.** If inversion in the *octave* takes place by the upper part being placed an octave lower, or the lower part an octave higher, or both parts an octave in opposite directions, no modulation occurs, as the scale is

not changed; but if both parts are moved in opposite directions by steps that involve a new scale, modulation will be effected to the key corresponding to the new scale. Thus, if the lower part is placed a perfect 5th higher and the upper part a perfect 4th lower, they will evidently both be in the scale, or key, of the dominant; or if the lower part is placed a perfect 4th higher and the upper part a perfect 5th lower, they will be in the scale, or key, of the sub-dominant. Modulation may thus be effected to any key by simply moving each part bodily to the scale of that key (moving the parts in such direction as will produce inversion).

45. Inversion in the *10th* can only be effected in four ways: *first*, the upper part may be placed a 10th lower; *second*, the lower part may be placed a 10th higher; *third*, the upper part may be placed an octave lower, and the lower part a 3d higher; *fourth*, the lower part may be placed an octave higher, and the upper part a 3d lower. Of course the modulation will not be through the part moving an octave; but the part moving a 3d or 10th (octave + 3d) will evidently be in a new scale a major 3d above or below the old key, according as the modulating part is placed above or below. If the old key is C, the new key will be E or A ♭ (as the case may be).

46. If the inversion were by any other than the four ways mentioned, both parts would modulate, but to different keys. Thus, if the lower part is placed a perfect 5th higher and the upper part a major 6th lower, then one part would be in the key a perfect 5th above, and the other in the key a major 6th below, the old key. If the old key is C, then one part would be in the key of G and the other in the key of E ♭; but the music cannot be in two keys at the same time.

47. Modulation by inversion in the *12th* corresponds in every point to that in the *10th* by simply substituting the perfect 5th for the major 3d. The modulation will be to the key of the dominant (perfect 5th above) or sub-dominant

(perfect 5th below), according as the modulating part is placed above or below.

48. Modulation by inversion in the *15th* corresponds to that in the octave.

49. Modulation by inversion in the *9th*, *11th*, *13th*, and *14th* is similar to that in the *10th* and *12th* (differing only in the modulating step).

50. In any case, the modulation is caused by one or both parts moving by some other interval than an octave. Though the modulation may be only in one part so far as the accidentals involved are concerned, yet, of course, both or all the parts are included in the modulation, since the music cannot be in different keys at the same time. The modulation will naturally begin with and continue through the entire section of the music thus inverted, and may therefore begin some distance in advance of the accidental, or sign of modulation.

51. If modulation occurs in the original parts (before inversion), then, of course, the modulation by inversion will be reckoned (during the continuance of that modulation only) from that key instead of from the original or signature key.

52. It sometimes occurs (where the keys are closely related) that the tone in which the keys differ (and therefore the accidental) does not happen to be used, yet still modulation may result through the tendency of the part inverted to retain and carry with it its key individuality (if strong), since the interrelationship of its tones remains intact. Thus modulation sometimes occurs without accidentals. Modulation is effected whenever the feeling of modulation is produced.

53. **Counterpoint Invertible in Various Intervals.** Counterpoint in the *octave* may also invert in the *10th*, *12th*, or *15th*, since its compass is within the others. For the same reason, counterpoint in the *10th* may also invert in the *12th* or *15th*; and counterpoint in the *12th* may also invert in the

15th. In each case, however, the parts should be constructed with reference to each inversion.

54. Counterpoint may also be made invertible in different intervals by adding 3ds. This consists in duplicating one or both parts in the 3d above or below, thus giving three or four parts. If in counterpoint in the *octave* 3ds be added above the upper part or below the lower part, the new part thus added will be in the *10th* with the other outside part, and the counterpoint is thus invertible in both the *octave* and *10th*. If 3ds are added both above the upper part and below the lower part, then the inner parts will be in the *octave*, the inner and outer parts in the *10th*, and the outer parts in the *12th*. If the original parts invert in the *12th* and 3ds added both below the upper and above the lower part, the result will be the same.

55. In applying this method of added 3ds, the following additional rules will be necessary:

(1) Use dissonances only as passing notes.
(2) Use consonant intervals alternately as much as possible.
(3) Use only oblique or contrary motion.

56. **Triple and Quadruple Counterpoint.** These consist of three or four distinct parts, each standing to each in the relation of a double counterpoint in the octave.

57. Triple counterpoint will give six different combinations, and quadruple counterpoint will give twenty-four different combinations, according to the principle of Permutation.

IMITATION

1. Counterpoint is made up largely of *Imitation.*

2. *Partial Imitation* is where a part of a preceding melody is imitated. *Canonical Imitation* (see Canon, p. 128) is where the preceding melody is imitated throughout.

3. Imitation may take place in the unison or at any other

interval, in any part or number of parts, and at any place. The part imitated may be called the *model.*

4. Imitation may be outlined thus:

Imitation. { Strict. / Free. / Retrograde. / By Contrary Motion. / By Augmentation. / By Diminution. / By Reversed Accents.

5. In *Strict* Imitation the intervals of the model are not changed—half-step answering to half-step, whole step to whole step, and therefore major to major, and minor to minor. This is the usual character of imitations in the unison or octave, since the scale is not changed.

6. In *Free* Imitation some of the intervals of the model are changed—the imitation being by similar degrees of the staff regardless of the half-steps, and therefore major often answering to minor, and *vice versa*. This is the usual character of imitations in any other interval than the unison or octave, since the scale is changed.

7. In *Retrograde* Imitation the model is imitated backward, from end to beginning (strict or free).

Fig. 26.

8. In *Imitation by Contrary Motion* the model is imitated upside down (strict or free). If strict, the imitation must be in accordance with the pattern shown in Fig. 26, which represents a section of the major key pattern (and may be extended into the full pattern).

9. Observe that the reverse scale begins a 3d above the key-note (1) of the direct scale, and also that the intervals of both direct and reverse scales are the same. Therefore, if the imitation corresponds in the reverse scale to the model in the direct scale, it will be strict (half-step answering to half-step, and whole step to whole step). Of course, this pattern, like the key pattern, may be set to any key.

10. Imitation by contrary motion in minor keys is best made by the pattern shown in Fig. 27, which represents a section of the minor key pattern (and may be extended into the full pattern). It will be seen that when the 3d of either scale is used, the imitation ceases to be strict, or else involves a chromatic tone.

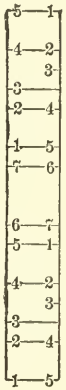


Fig. 27.

11. In *Imitation by Augmentation* the time value of each note of the model is increased or augmented (usually doubled).

12. In *Imitation by Diminution* the time value of each note of the model is diminished (usually one-half).

13. In *Imitation by Reversed Accents* the accents are reversed (unaccented for accented, and *vice versa*) by the imitation entering on an opposite phase of the measure from that on which the model entered.

14. **Modulation by Imitation.** If the imitation takes place in the unison or octave it is evident that no modulation will be involved, since the scale is not changed; or if the imitation be free, it may take place at any other interval without involving modulation (the imitation being by similar degrees of the staff regardless of the half-steps); but if the imitation be strict and at any interval involving a new scale, modulation will naturally result. The interval between the old and new key letters will correspond to the interval at which the imitation takes place; thus, if the imitation takes place at the interval of a perfect 5th above or a perfect 4th below, the modulation will be to the key of the dominant, etc.

15. If the imitation be by contrary motion in accordance with the pattern shown in Fig. 26, no modulation will be involved, since the intervals of the reverse scale correspond to the intervals of the diatonic scale and therefore in the same key. Otherwise modulation may occur, since any other reverse scale would be in some other key. In any case, 3 of reverse scale will be on the key-note as in pattern.

16. In minor keys if the imitation by contrary motion be in accordance with pattern shown in Fig. 27, no modulation will be involved, for same reason as given above (3 being free or involving a chromatic tone). Otherwise modulation may occur. In any case, 5 of reverse scale will be on key-note as in pattern.

17. Of course, in any case, the modulation is usually indicated by the accidental following. The modulation naturally begins, however, with the imitation and therefore frequently some distance in advance of the accidental. It sometimes happens (when the keys are closely related) that the accidental involved in the new key is not required, yet modulation may result through the tendency of the model to retain and carry with it its key individuality (if strong and the imitation strict).

CONTRAPUNTAL MUSIC

1. Any combination of melodies may be regarded as contrapuntal music; but the most important contrapuntal forms of musical composition are the *Fugue* and the *Canon*. Points of contrapuntal imitation are frequently found in other music, especially in choruses.

2. The *Fugue* is a composition in which a musical phrase called the *Subject* is given out by one part and imitated by the other parts in succession, thus:

Soprano			Answer
Alto		Subject	Counter-subject
Tenor	Answer	Counter-subject	Free Counterpoint
Bass	Subject	Counter-subject	Free Counterpoint

(Any part may begin the Fugue.)

3. The *Answer* is the subject imitated in the key of the dominant, either above or below. The *Counter-subject* is the continuation of the subject or answer during the imitation in the next part.

4. The counter-subject need not appear in the voice which enters last. After the counter-subject each part is continued by adding free counterpoint. The subject and counter-subject should be in double counterpoint so that they may be

inverted, since they are to be interwoven in all possible combinations in the subsequent treatment.

5. The subject, answer, and counter-subject are called the *Exposition*, as they form the subject-matter from which the fugue is to be developed. The structural form of the fugue may be outlined thus:

- Fugue Form
  - 1. The Exposition
    - Subject.
    - Answer.
    - Counter-subject.
  - 2. The Contrapuntal Development
    - Episode.
    - Repercussion and episode.
    - Stretto.
    - Final episode.

6. The *Episodes* are the free modulations which connect the parts and lead from one key to the next.

7. The *Repercussion* consists of new combinations of the subject and answer in different keys; each combination being followed by an episode leading into another key.

8. The *Stretto* consists of combinations in which the subject and answer overlap. Where there are several strettos, they should come in the order of their closeness, the closest coming last. Sometimes the repercussion is made up of strettos.

9. The principal kinds of fugues may be classified thus:

- Classification of Fugues
  - As to number of voices
    - Two-voiced fugues.
    - Three-voiced fugues.
    - Etc.
  - As to number of subjects
    - Single fugues.
    - Double fugues.
    - Etc.
  - As to kind of imitation
    - Augmented fugues.
    - Diminished fugues.
    - Inverted fugues.
  - As to character of subject
    - Diatonic fugues.
    - Chromatic fugues.
  - As to general treatment
    - Strict fugues.
    - Free fugues.

10. The *Canon* is a composition in which the parts enter one after the other, each imitating the melody of the first part (called the subject) throughout.

11. An imitating part may enter at any point, and at any interval, up or down. The different kinds of imitation may be employed and the different parts may employ different kinds of imitation; or some of the parts may be in *Canon*, and the other parts free. There are also canons with more than one subject.

12. Canons are usually described by figures showing the number of parts and subjects, the first figure showing the number of parts, or voices, and the second figure showing the number of subjects, thus: Canon 2 in 1, 3 in 1, 4 in 2, etc.

13. A *Finite* Canon is one in which each part is silent after completing the melody, or subject; or one which ends with a regular close like other compositions.

14. An *Infinite* Canon is one in which each part begins again after completing the subject, the canon thus being without end.

15. A *Circular* Canon is one which modulates from one key to the next around the key circle, the subject recommencing each time in the key a 4th or 5th higher or lower; or the subject may recommence a tone higher or lower, thus modulating by alternate keys. The conclusion of the subject should lead naturally each time into the new key. The circular canon is also endless.

16. An *Open* Canon is one in which the different parts are written out in full.

17. A *Close* Canon is one in which the principal part only is written out, and the number of parts and their places of entrance are indicated by the sign §.

18. The *Enigma* (or riddle) Canon is a kind of musical problem in which the places of entrance of the succeeding parts are not indicated, but left to be solved.

19. The canon may be classified as follows:

Classification of Canons

- As to interval of imitation
  - Canons in unison.
  - Canons in 2d.
  - Canons in 3d.
  - Canons in 4th.
  - Etc.
  - Mixed Canons — the parts imitating at different intervals.
- As to number of parts and subjects
  - Canons 2 in 1.
  - Canons 3 in 1.
  - Canons 4 in 2.
  - Etc.
- As to strictness of imitation
  - Strict canons (see Strict Imitation).
  - Free canons (see Free Imitation).
- As to style of imitation
  - Canons in similar motion.
  - Canons in contrary motion (see pp. 124:8; 125:10).
  - Canons in augmentation (see p. 125:11).
  - Canons in diminution (see p. 125:12).
  - Retrograde canons (see Retrograde Imitation).
- As to limitations
  - Finite canons (limited).
  - Infinite canons (endless).
  - Circular canons (endless).
- As to score
  - Open canons.
  - Close canons.
- Enigma canons.

20. In the *fugue* the subject is sometimes only a short musical phrase. In the *canon* the subject is an entire melody.

MELODY

1. Music is divided into three general classes: *Monophonic* (single sounding), one-part music (melody); *Polyphonic* (many sounding), combined melodies (counterpoint); *Harmonic* (united sounding), accompanied melody (harmony).

2. *Monophonic* music (melody) is the original form of all music. The ancients, though sometimes having choirs of many voices, sang only in unison (or naturally in octaves, when men and women sang together). Melody is still the prevailing music of the Turks, Greeks, and most oriental nations, who seem to have a distaste for *part* music.

3. *Polyphonic* music (counterpoint) dates back about seven hundred years, when the early attempts at *part* music began to assume shape.

4. *Harmonic* music (harmony) is based on principles of acoustics. It is also, in a sense, a gradual outgrowth of counterpoint, and dates back only about two hundred years as a recognized distinct system.

5. Melody is a succession of tones, while harmony is a concord of tones.

At 1 we have a concord of tones, or tones heard simultaneously in harmony; while at 2 we have the same tones, but heard successively in melody. The first is called a *chord;* the second, a *melodic figure;* and just as harmony is made up of chords, so melody is made up of figures.

6. A chord and a figure composed of the same notes contain, in a sense, the same musical idea; but the figure conveys the additional idea of motion, while the chord conveys the idea of rest, or completeness in itself.

7. The principles of harmony as applied to chords, naturally, in a general sense, apply also to figures; for harmonic

combinations naturally make melodic successions. In this sense a figure is a resolved chord and melody is resolved harmony. But, as already observed, the figure conveys the additional idea of motion, so that it has a melodic element combined with its harmonic element; the harmonic connection between the successive notes is in proportion to the consonance of the interval between, while the melodic connection is in proportion to the closeness of the interval between.

8. The melodic importance of the 2d is due to its being the shortest melodic step. It is freely used in melody, since the notes forming it do not sound simultaneously. It is thus often used as a passing note between the harmonically connected tones to increase the smoothness of the melodic flow. It is the only diatonic step with a purely melodic value (being harmonically dissonant); the other diatonic steps used have both a harmonic and melodic value.

9. **Melodic Progression** involves relationship between the consecutive notes (grouped into figures), just as harmonic progression involves relationship between the consecutive chords, and just as speech involves grammatical relationship between the different words.

10. Melody is more than a mere succession of related tones. For a succession of tones to be melody it must have melodic flow and rhythmic movement. Melody, therefore, is a melodious, rhythmical succession of tones.

11. The *figure* is the smallest complete rhythmical division of a melody. The *figure*, therefore, has a rhythmic element in combination with its harmonic and melodic elements. The figure usually covers one or two measures, called, respectively, simple and compound figures. The figure may begin in one measure and end in another, in which case the melody begins with an incomplete measure.

12. **Development.** A figure may also be defined as a series of notes containing a musical idea, and which may be taken as a subject, or theme, for development. When thus used

the figure is called a theme, and the treatment involved in development is called *thematic treatment*.

13. The principal methods of thematic treatment may be outlined as follows:

Methods of Thematic Treatment

- Transposition (placing the figure at a higher or lower pitch).
- Expansion (expanding one or more intervals of the figure).
- Contraction (contracting one or more intervals)..
- Augmentation (increasing the time value of each note).
- Diminution (diminishing the time value of each note).
- Repetition (repeating fragments or certain notes of the figure).
- Omission (omitting fragments or notes).
- Reversion (the figure written backward from end to beginning).
- Contrary Motion (the figure written upside down).
- Change of Order (irregular change of the order of the notes of the figure).
- Rhythmic Change (change of the rhythm of the figure).
- Ornamentation (with various passing notes, turns, trills, etc.).
- Simplification (reverse of ornamentation).
- Combination (any two or more of the above combined).

Some of these methods are much used, and others but little used.

14. Thematic treatment modifies the character of a figure, or theme, without entirely destroying its individuality. Of course, if a figure is so changed as to lose its individuality it becomes a new figure. The figure may be recognized through any one or more of its three elements (harmonic, melodic, and rhythmic); but if all three are changed there is no means of recognition, and the figure loses its individuality.

15. By means of thematic treatment an entire melody is often developed from a single figure, but more usually a number of figures, or themes, are used: the first, being most prominent, is called the principal theme; and the others, secondary themes. The greater the number of themes, the greater the variety and contrast; but too many themes tend to destroy the unity of the melody. A principal idea must pervade the entire melody; otherwise, it will have no definite meaning; just as a literary composition without a principal subject, or theme, would have no definite meaning, and

therefore lack interest by being difficult to understand. In either case, the unity or oneness of the composition is through a principal idea pervading the whole. On the other hand, without variety and contrast the composition would lack interest by being monotonous.

16. In melody variety is largely attained by thematic treatment (development) of the same theme, just as in literary compositions variety is largely attained by presenting the same theme in various lights (also thematic treatment); but in either case, the sense of the principal theme is often most clearly brought out by using contrasting themes.

LINGUISTIC CHARACTER OF MUSIC

1. Music should not be looked upon merely as a pleasing combination of tones. Properly understood, music is a language through which ideas and thoughts, sentiment and emotion, are expressed. It differs from spoken language in that it is natural and universal (in the form of melody), while spoken language is artificial and local.

2. Musical perception is to some extent a natural gift possessed by all, though in different degrees, and which is highly susceptible of cultivation.

3. The basis of spoken language is the alphabet; the basis of musical language is the music scale.

4. Just as spoken language is made up of letters combined into words, words into phrases, phrases into clauses, clauses into sentences, sentences into paragraphs, and paragraphs into compositions, so musical language is made up of tones combined into figures (or chords in harmony), figures into phrases, phrases into sections, sections into periods, periods into movements, and movements into the higher forms of musical composition.

5. Melody (being regulated by rhythm) may be called the poetry of music, and the *recitative* (musical declamation), its prose.

6. Melodic motion imitates mental motion. Thoughts are mental motions. Our thoughts may move slow or fast; they may revel in pleasant fancies or wander through sad memories; they may be aimless or energetic, restless or determined, calm or excited. Melodic motion is capable of expressing by imitation every species of mental motion in the most delicate and exact manner.

7. Melody, therefore, is more than merely a melodious, rhythmical succession of tones; it is sentiment and emotion expressed in tones instead of words.

THE PERIOD

1. The **Period** is a musical sentence. It consists of several phrases so related as to produce the sense of completeness.

2. The **Phrase** is a musical expression having a well marked repose. A **Passage** is a series of figures having no well marked repose.

3. **Rhythmic Structure.** The *period* is a rhythmical whole which, in its regular form, is divided rhythmically into halves called sections; the sections, rhythmically into halves called phrases; and the phrases, rhythmically into halves called figures, designs, or motives, thus:

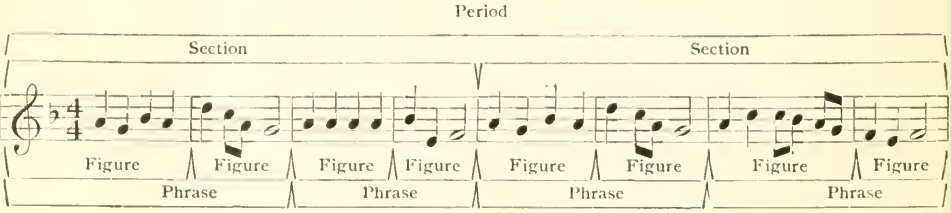


FIG. 28.

4. The figure may sometimes be divided into rhythmical fragments called germs. (The term "rhythm" in its strict sense includes not only the smaller rhythmical divisions, but also the larger rhythmical combinations.)

5. It will be seen that the above period contains eight measures. Evidently, if we double the time value of each note without changing the time value of the measure, we would double the number of measures, and *vice versa*. Also, if we divide the time value of each measure ($\frac{4}{4}$ into $\frac{2}{4}$, or $\frac{6}{8}$ into $\frac{3}{8}$, etc., thus dividing each measure into two) without changing the time value of the notes, we would double the number of measures, and *vice versa*. The character and number of measures depend largely upon the character of the figure.

6. The regular form of the period contains four, eight, or sixteen measures, most usually eight. When incomplete measures occur at the beginning and end of the period they count together as one measure.

7. The regular form of the period may be contracted or expanded in various ways: *1st*, the period may be cut short by rests, in which case the measure (or measures) without notes is counted as part of the period; *2d*, the two sections of the period may overlap, the last measure of the first section being also the first measure of the second (periods may also overlap in the same way); *3d*, the two sections may be connected by a short passage leading from one to the other (periods may also be connected in the same way); *4th*, the first two measures may be repeated; *5th*, the last two measures may be repeated; *6th*, single figures may be repeated; *7th*, a short conclusion may be added; *8th*, a short introduction may be prefixed; etc. However, introductions, conclusions, and connecting passages are not strictly a part of the period.

8. The rhythmical division of the period sometimes varies more or less from the regular form given.

9. **Thematic Structure.** Since melody is made up of periods just as spoken language is made up of sentences, therefore what was said on the development of melody by means of thematic treatment applies to the structure of periods.

10. The character of a tone is its mental effect or tonality. These combined make up the character of the theme (figure). These, in turn combined, make up the character of the phrase, and so on up. So that each combination in turn is, in a sense, a larger theme with a character made up of the combined characters of its component parts. Ascending series of tones express exaltation; descending series of tones express relaxation. A series which both ascends and descends is vague, having no special character; but if on the whole ascending it partakes of the character of an ascending series, and *vice versa*, therefore the general character of a figure, phrase, or any succession of tones is exaltation or relaxation in proportion as it is on the whole ascending or descending.

11. The phrase may consist of a single figure, or of figure and repetition, or of figure and treatment, or of different figures, or of treatments of same or different figures (a treatment being merely some variation of a preceding figure).

12. While the *figure* stands in the relation of theme to the *phrase* and through the phrase to the entire period, yet the *phrase* itself stands to the period directly in the relation of a more comprehensive theme.

13. The period usually contains four phrases; but there is no fixed mold in which the period is cast, either as to its rhythmic or thematic (especially thematic) structure. It should be well proportioned as to unity and variety: unity involving a principal idea binding the whole together; variety involving thematic treatment, and often contrasting themes.

14. The independent period (not dependent on the preceding or following period) is commonly constructed as follows: the *first* phrase sets forth the principal theme, which should excite anticipation; the *second* phrase is of the nature of a partial response; the *third* phrase is usually a repetition of the first phrase (sometimes in a modified form); and the *last* phrase is a complete and final response. (See Fig. 28.)

15. The ending or beginning of a period is sometimes in-

fluenced through its connection with the following or preceding period (by the leading to or from).

16. The combination of periods into musical forms will be treated under "Form."

FORM

1. Up to this point we have been dealing mostly with the material out of which musical compositions are constructed.

2. *Form* deals with the arrangement of this material into definite shapes called *musical forms.*

3. Just as poetic forms consist of syllables combined into feet, feet into lines, lines into stanzas, and stanzas into complete poems, so musical forms consist of notes combined into figures, figures into phrases, phrases into periods, and periods into complete movements.

4. In setting a poem to music, the form of the music must be made to fit the form of the poem. The sentiment of the music must also correspond to the sentiment of the poem.

5. If the stanzas of the poem are similar in sentiment and form, the same music may be repeated to each stanza. This is called the *Strophic Form.*

6. But if the stanzas differ in sentiment, the same music would not be suitable to each, and therefore the music should be set to the poem from beginning to end. This is called the *Art Song Form* (or through composed).

7. These, however, are only incidentally called forms, as they do not refer to the internal structure of the music.

8. *Form* in its strict sense refers to the structural shape of a piece of music, and therefore involves the internal structure of the period, the combination of periods into movements, and movements into more extended compositions.

9. As the structure of the period has already been considered, it only remains to consider the combinations of periods and of movements. A composition consists of as many movements as there are actual changes in time, either

as to the time value of the measure (see p. 22 : 6) or the tempo (see p. 30 : 4).

10. All form (music or other) is based on the principles of unity, contrast, and symmetry. *Unity* requires that the parts be so related and connected as to form one complete whole; but without contrasts the whole would be a shapeless mass. *Contrast* is necessary to remove too much sameness, thus giving shape and character to the whole.

11. *Unity* and *contrast* tend to counteract each other, and *symmetry* is their proper balance.

12. In musical forms *unity* is attained: *first*, by using a principal subject, or theme, which is so interwoven throughout as to bind the parts together and determine the general character of the whole; *second*, by welding the parts together—i.e., causing each part to lead naturally into the next, either directly or by a connecting passage.

13. *Contrast* is attained: *first*, by using secondary subjects in contrast to the principal subject—but these must be less prominent by being used less frequently, and each occurrence being followed by a return to the principal subject; *second*, by development of the subject-matter; *third*, by change of key; *fourth*, by change of movement.

14. *Symmetrical* form is the result of a proper balance in the use of the above means.

15. The smallest distinct form is the figure. Figures are combined into larger forms called phrases, and phrases into larger forms called sections, and sections into larger forms called periods. But in the period we recognize the first complete and independent form.

16. **The Song Form.** The simplest complete musical form is the song form of one period.

17. There are also song forms of two and three periods. The spirit of the first period (in forms of more than one period) stands to the whole in the relation of principal subject. (By way of distinction, the principal subject may be

called the theme, and the secondary subjects may be called episodes.)

18. The Song Form may be outlined thus:

- **Song Form**
  - Of one period—all single church tunes or chorals.
  - Of two periods
    - 1st period—theme
    - 2d period—episode and return of part of theme as close

    → All double church tunes and many secular songs; the second period sometimes taking the form of a chorus.
  - Of three periods
    - 1st period—theme
    - 2d period—episode in related key
    - 3d period—return of theme in Tonic key

    → Most songs with chorus; the 3d period usually taking the form of a chorus.

19. **The Scherzo, Minuet, or Applied Song Form.** This is a combination of song forms. The *Scherzo* (meaning sport, jest) is a sprightly, animated piece of playful character. The *Minuet* is an ancient, slow, stately dance. The minuet is in triple rhythm, while the scherzo or applied song may be in any rhythm. Their forms, however, are similar and may be outlined thus:

- **Scherzo, Minuet, or Applied Song Form**
  - 1st part—theme
    1. Theme (sometimes ending in related key).
       Repeat.
    2. Either an episode or a *development of theme.* — Modulatory with return to theme in Tonic key
       Repeat.
  - 2d part—trio (So called because formerly written in three part harmony)
    1. New theme (in related key to theme of 1st part).
       Repeat.
    2. Either an episode or a *development of theme.* — Modulatory, with close in Tonic of trio.
       Repeat.
  - 3d part—theme (same as 1st part without repeats).

→ Most marches, dances and parlor piano music are in this or the Rondo form.

20. The above form may be applied in full to the Scherzo; but omitting the italic parts, it would more properly be called Minuet form; and omitting also the repeats, it would more properly be called Applied Song form.

21. The minuet is also distinguished by its dance-like character. It may be said of the scherzo that it is very pliable as to form, and is sometimes written in the rondo or the sonata form; so that it is rather a style than a form, being distinguished by its sprightly, playful character.

22. Observe that the preceding form consists of two distinct parts which stand related to the whole as general theme and episode, just as in each part the theme and episode stand related to the part; the general theme binding the whole, just as the theme of each part binds the part, giving the sense of unity and completeness in each case.

23. **The Rondo Form.** The term *rondo* is derived from a French poetic form in which the first verse, after being followed by a second, is repeated.

24. The rondo is a musical composition in which the principal theme returns after every digression or episode. There are several kinds of rondos, which may be outlined as follows:

Rondo Forms

- 1st rondo form
  - Theme (usually a song form).
  - Episode (or passages in a related key).
  - Theme.
- 2d rondo form
  - Theme.
  - 1st episode in any related key.
  - Theme.
  - 2d episode in any other related key.
  - Theme.
- 3d rondo form
  - 1st part
    - Theme.
    - 1st episode, usually in Dom. key.
    - Theme (or a conclusion).
  - 2d or middle part
    - 2d episode or a development of 1st part. (Modulatory)
  - 3d part
    - Theme.
    - 1st episode, now in Tonic key.
    - Theme (or a conclusion).

Nearly all parlor piano music is either in this or the minuet form. (The rondo is usually the last movement in sonatas.)

Some rondos deviate more or less from the above.

25. **The Sonata Form.** This is the climax of musical form. A sonata is an instrumental composition consisting usually of three or four distinct movements (differing in tempo or rhythm). The first movement determines the character of the whole, and is therefore called the *Sonata movement.*

26. The sonata form in four movements may be outlined thus:

- **Sonata Form**
  - 1st, or sonata movement (*allegro*)
    - 1st part
      - 1. Theme.
      - 2. Episode, usually in Dom. key (or rel. major, if theme is in a minor key.)
      - 3. Final group (consisting of one or more closing episodes, also in Dom. key.)
      - 1, 2, and 3 are now repeated.
    - Middle part — Development (usually contrapuntal) of the theme and episode of 1st part (called the Free Fantasia, because not confined to any form), modulating through several keys and returning to Tonic key.
    - Repetition
      - Theme.
      - Episode—now in Tonic key.
      - Final group—now in Tonic key.
      - (Sometimes an appendix, or finale, is added.)
  - 2d, or slow movement (usually, *grave*, *largo*, *adagio*, or *andante*) Generally in a related key to that of 1st movement
    - This movement has no fixed form but may be in any of the following forms:
    - 1st—the sonata movement form (as above).
    - 2d—the variation form (A series of pieces in which the theme is changed and varied.)
    - 3d—the second rondo form.
  - 3d movement—a scherzo or a minuet.
  - 4th movement — Usually in the rondo form; but sometimes in the sonata movement form or the variation form

Sonatas, Sonatinas, Symphonies, Concertos, Concertinos, Classical Overtures, and all classic chamber music.

27. If an entire sonata were in one movement it would become very wearisome, but the different movements are so contrasted that each comes in as a relief to another; thus the slow movement comes in like a lull in a storm, and the 3d movement is preparatory to the final climax in the last movement. Sometimes the scherzo or minuet is placed before the slow movement. In three-movement sonatas the scherzo or minuet is usually omitted.

28. **Suite Form.** The old suite is a succession of old dance movements arranged with reference to contrast, and which gradually assumed the following order:

(Old Dances.)

Suite Form
1. *Allemande*—a cheerful movement in even rhythm.
2. *Courante*—a rapid, running movement in triple rhythm.
3. *Sarabande*—a dignified, stately movement in triple rhythm.
4. *Bourree*—a bright, quick, hearty movement in even rhythm.
5. *Gigue*—a very rapid movement, possessing a rough heartiness.

29. Other old dance movements sometimes used are: *chaconne*, a slow movement, generally major, and usually in triple rhythm; *passacaglia*, a rather bombastic movement in triple rhythm, closely resembling the *chaconne*, but usually minor; *minuet*, a slow movement in triple rhythm, danced with mincing, dainty steps, hence the name; *gavotte*, a genial skipping movement in even rhythm, usually beginning on the third beat, thus producing a mild syncopation; *pavane*, a slow, stately movement, similar to the *sarabande*, but in even rhythm; *rigaudon*, a lively movement in even rhythm, beginning on the third or fourth beat, and is sometimes sung as well as danced.

30. In the *modern suite*, more modern movements (not always dances) are frequently substituted for the old dance movements.

31. The *suite* is the oldest form in which different movements are combined, and is therefore the origin of the sonata and other modern forms.

32. **Contrapuntal Forms.** (See pp. 126–129.)

33. The foregoing are the principal recognized forms, and with slight changes practically cover nearly all varieties of music, and are therefore sufficient as a general analysis of form.

34. The common practice of calling nearly every slight distinction or difference a form leads to a great deal of confusion, and any attempt at outline is vague and unsatisfactory.

35. There are also certain introductory, intermediate, and concluding parts or passages, which are not generally regarded as an essential part of the form of a composition, as they are sometimes used and sometimes omitted. They may be classified thus:

Introductory	Prelude Introduction Overture Intrada Voluntary, etc.	A musical introduction to a more important composition, or a piece used as an opening to an oratorio, opera, or concert.
Intermediate	Interlude Intermedium Intermezzo	A piece of music placed between more important compositions or between the acts of an opera.
Concluding	Postlude Conclusion Coda Finale	The supplementary ending of a composition.

36. The general definitions given above sufficiently describe the general character of each division without going into distinctions, as the aim here is merely outline.

37. The terms of each division are sometimes used interchangeably. They are not, as a rule, confined to any fixed form. They should, in general, be proportioned in length to the composition to which they are attached.

CLASSIFICATION OF MUSIC

1. Music may be classified as follows:

- **Classification of music**
  - **Vocal** (with or without instrumental accompaniment)
    - Sacred — Hymn, Psalm, Chant, Choral, Anthem, Antiphony, Motet, Mass, Oratorio, etc.
    - Secular — Ballad, Glee, Madrigal, Opera, Opera Bouffe, Grand Opera, etc.
    - Sacred or Secular — Song, Recitative, Aria, Arietta, Chorus, Cantata, Cantatilla, etc.
  - **Instrumental**
    - Classical — Sonata, Sonatina, Symphony, Concerto, Concertino, Suite, Overture, Nocturne, Fantasia, Capriccio, Scherzo, etc.
    - Dances
      - Old Dances — Allemande, Courante, Sarabande, Bourree, Gigue, Chaconne, Passacaglia, Minuet, Gavotte, Pavane, Rigaudon, etc.
      - Modern Dances — Polonaise, Mazurka, Polka, Schottische, Waltz, March, Quickstep, Galop, Fandango, Reel, Quadrille, Cotillon, etc.
  - **As to number of voices or instruments** — Duet, Trio, Quartet, Quintet, Sextet, etc.
    - Called Chamber Music when written for stringed instruments, or for piano and other instruments.

2. **Sacred Vocal Music.** The *Hymn* is a song of praise or thanksgiving to God. A *Psalm* is a metrical translation of one of the Psalms set to music. A *Chant* consists of words recited to musical tones without musical measure. The *Choral* is a psalm or hymn sung in unison by the congregation. An *Anthem* is a setting of scriptural texts to music. The *Antiphony* is the most ancient form of church music, and consists of responsive singing, one part or choir answering or responding to another. The *motet* is also a species of hymn with a scriptural text or texts, designed for chorus or for choruses interspersed with solos; it is usually livelier and more brisk than other religious music and is sometimes used as

synonymous with anthem. The *Mass* is a musical composition used in the Catholic Church in celebrating mass, hence the name. The *Oratorio* is a sacred musical drama, and consists of recitatives, choruses, solos, duets, trios, etc., accompanied by orchestra.

3. **Secular Vocal Music.** A *Ballad* is a narrative told in song. The *Glee* is a composition of a light character, usually sung by one voice to a part, and generally unaccompanied. The *Madrigal* is a composition for voices without accompaniment, each part being supported by several voices. The *Opera* is a secular musical drama, and consists of an overture, arias, choruses, recitatives, duets, trios, etc., accompanied by scenery and dramatic action. If the character is serious it is called a *Grand Opera*. If the character is comic it is called an *Opera Bouffe*, or comic opera. The *Operetta* is a short, light opera.

4. **Sacred or Secular Vocal Music.** *Song* is a general term applicable to all vocal music, whether of human beings or of birds, but most usually suggests a simple melody repeated to each stanza of a sacred or secular poem. The *Recitative* is a musical declamation imitating declamatory speech with the singing voice, usually with instrumental accompaniment. The *Aria*, in its general sense, is an air, or melody; more strictly, it is an accompanied solo, usually similar in form to a minuet. The *Arietta* is a small aria. The *Chorus* is a composition for numerous voices. The *Cantata* is a composition mixed with recitatives, arias, and choruses, with instrumental accompaniment. The *Cantatilla* is a small cantata.

5. **Classical Instrumental Music.** The *Sonata* (see p. 141 : 25). The *Sonatina* is a small sonata. The *Symphony* is a sonata for full orchestral accompaniment. The *Concerto* is usually a sonata in three parts, in which one or several concerting instruments play the principal parts accompanied by an orchestra. The *Concertino* is a small concerto. The

Suite (see p. 142 : 28). The *Overture* is a composition used as an opening to an oratorio, opera, concert, or drama, and is usually in the form of the Sonata Movement. The *Concert Overture* is an independent composition for concert performance. The *Nocturne* is a composition of the character of a calm night, hence its name. The *Fantasia* is a composition for solo instrument written without regard to the restrictions of form. The *Capriccio* is a composition written in a capricious or free style—a species of *fantasia*. The *Scherzo* (see p. 139 : 19).

6. **Old Dances.** (See p. 142 : 28, 29.)

7. **Modern Dances.** The *Polonaise* and the *Mazurka* are Polish national dances. They are written in $\frac{3}{4}$ time. The *Polonaise* is slow and stately and is more of a walking or stepping than a dance. The *Mazurka* is lively and of a sentimental character. The *Polka* is a skipping $\frac{2}{4}$ movement of Bohemian origin. The *Schottische* is similar to the polka, but somewhat slower. The *Waltz* is a circular whirling dance in $\frac{3}{4}$ time. The *March* is a movement suited to guide the walking of masses. The *Quickstep* is a quick, lively march. The *Galop* is a quick dance tune. The *Fandango* is a lively Spanish dance tune in $\frac{3}{8}$ or $\frac{6}{8}$ time. The *Reel* is a lively Scottish dance tune. The *Quadrille* is a French dance tune performed by four couples placed in quadrangular position, hence the name. The *Cotillon* is a lively, animated dance tune, usually in $\frac{6}{8}$ time.

8. Every dance has its own particular rhythm, which gives it its character.

PART THIRD

ACOUSTICS

1. **Acoustics** treats of the laws of sound. Sound is caused by vibrations. If the vibrations are regular a musical tone is produced, while noise is the result of irregular vibrations.

2. The range of sound is from about 16 vibrations per second to about 38,000 per second (about eleven octaves), as these limits represent the capacity of the ear to respond. The range of the seven-octave piano is from about 32 to 4100 vibrations per second.

3. The velocity with which sound travels may be determined by the simple method of observing the time between seeing a gun fired and hearing the report (the time for light to travel being inappreciable); then by calculations based on the distance and time we may determine the velocity, which is thus found to be about 1100 feet per second, being influenced somewhat by the state of the atmosphere. It has also been found by tests that all sounds travel with the same velocity.

4. Sound travels through the air in waves similar to waves of water, except that the waves are to and fro instead of up and down. As the pressure of the air is in all directions there is only room for compression and expansion, thus producing to-and-fro waves, which circle outward in all directions.

The vibrations of the sounding body are transmitted to the air, producing similar vibrations in the particles of air, each impulse passing onward from one particle to the next. Each particle of air passes through every possible phase (position) of vibration during one complete vibration.

5. The length of a sound-wave is the distance between any two particles in exactly the same phase, including between them every possible phase of one complete vibration. The waves thus advance, while the particles of air merely vibrate.

6. Since the velocity of sound is about 1100 feet per second, if we divide 1100 by the number of vibrations corresponding to any pitch we would get the wave-length of that pitch. We would thus find that the wave-lengths corresponding to all the tones of the seven-octave piano would range from about three inches to about thirty-four feet.

7. **The Laws of Vibration** are most easily studied by means of taut strings.

8. If a taut string is plucked (as in the guitar), bowed (as in the violin), or struck (as in the piano), it will be seen to vibrate from side to side; the tone produced depending upon the length, tension, thickness, and weight of the string. Three things will be noticed: loudness, pitch, and quality. The *loudness* depends on the force of the stroke (or the amplitude of the vibrations); the *pitch* depends on the number of vibrations per second; and the *quality* depends on the compound nature of the vibrations (all strings vibrate, not only as a whole, but also in parts which produce overtones upon which depends the quality of tone, as all simple tones of the same pitch sound alike).

9. A *Sonometer* is an instrument for studying the vibrations of strings. It consists of a long resonance box over which one or more strings may be stretched by means of weights and pulleys, and provided with a graduated scale and a movable bridge so that the exact vibrating length of the string may be measured.

10. By means of the sonometer the following laws have been demonstrated:

11. **First Law.** *The shorter the string the faster it vibrates in inverse proportion to the length* (shortening the string to $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, etc., increases the number of vibrations 2, 3, 4, 5, etc., times).

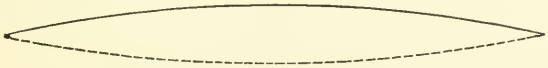
12. **Second Law.** *The tighter a string is drawn the faster it vibrates, but in direct proportion to the square root of the tension* (thus, increasing the tension 4 times, 9 times, etc., increases the number of vibrations 2 times, 3 times, etc.).

13. **Third Law.** *The thicker the string the slower it vibrates in inverse proportion to the thickness* (thus, doubling the diameter of the string diminishes the number of vibrations one-half).

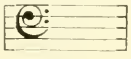
14. **Fourth Law.** *The greater the density, or weight, of the string the slower it vibrates in inverse proportion to the square root of the weight* (thus, multiplying the weight by four divides the number of vibrations by two). Strings are sometimes coiled with wire to increase their weight.

15. **Fifth Law.** *The intensity, or loudness, is in direct proportion to the square of the amplitude (extent) of vibration* (thus, doubling the amplitude increases the loudness four times). The time of vibration is not affected by the amplitude of vibration, provided other conditions remain the same: just as the time of each swing of a pendulum is not affected by the amplitude, or extent, of the swing, provided the length of the pendulum remains the same.

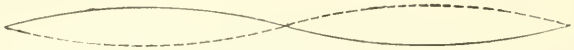
16. **Compound Tones.** If a taut string be struck, its fundamental tone is due to its vibrations as a whole, thus:



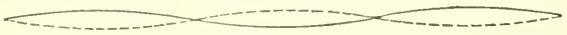
(*a*),

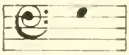
which we will suppose is this,  tone. Now if the string be lightly touched at its middle point (just enough to

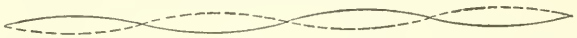
prevent its fundamental vibrations but not to push it aside from its straight position) and made to vibrate, it will vibrate in halves, thus:

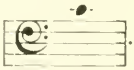

(*b*)

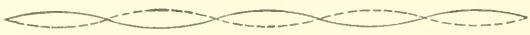
(called segments or loops, and the dividing point a node); each part, being half the length of the string, will vibrate twice as fast (Law 1); the tone produced will be the octave of the fundamental tone, which is this, . Again, if the string be touched at one-third its length and the shorter part struck, the whole string will vibrate in thirds, thus:


(*c*);

each part being one-third will vibrate three times as fast as the whole string, and the tone produced will be a perfect 5th above the first octave, which is this,  . Again, if the string is touched at one-quarter its length and the shorter part struck, it will vibrate in fourths, thus:


(*d*),

and each part, being one-fourth the length of the string, will vibrate four times as fast, and will sound the second octave of the fundamental, which is this,  . Again, if the string be touched at one-fifth its length and the shorter part struck, it will vibrate in fifths, thus:


(*e*);

each part vibrating five times as fast as the fundamental, and sounding the major third above the second octave, which is this, . We may continue thus to divide the string indefinitely.

17. Now if the string be made to vibrate free, it will not only vibrate as a whole but will at the same time vibrate, more or less (varying somewhat, as to relative proportions, with character of string and place, manner, and force of its excitation), in halves, thirds, fourths, etc., indefinitely.

18. By trying to conceive of the string vibrating as *a*, *b*, *c*, *d*, and *e* at the same time (the whole like a large wave bearing on its surface smaller waves, and these still smaller, etc.), we may form an approximate idea of the compound nature of the vibrations and, in turn, of the compound nature of the resulting tone, which is a compound of the fundamental tone and the overtones produced by the vibrating segments—the overtones growing weaker as they ascend in pitch. Some of the lower overtone vibrations may be plainly seen on the lowest strings of almost any stringed instrument, but the higher overtone vibrations are too rapid to be seen.

19. Any fundamental tone with its overtones is called a *Harmonic Series*. Fig. 29 shows the harmonic series of great C. The series is the same for all tones, differing only in pitch.

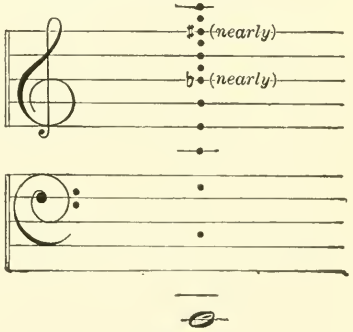


Fig. 29.

20. Any harmonic series is called a chord of nature, as the compound tone thus produced may be considered in itself a natural chord or combination of tones.

21. By the pitch of a compound tone is meant the pitch of its fundamental, this being the absorbing or ruling tone.

22. The overtones produced by the uneven divisions of the string (thirds, fifths, etc.) are easier to hear than those produced by the even divisions (halves and fourths, forming octaves, so completely blend into the fundamental as to be practically absorbed). The perfect 5th above the first octave

(produced by the string vibrating in thirds) is the easiest heard, and after this the major 3d above the second octave (produced by the string vibrating in fifths). Lightly sounding the note we wish to distinguish, previously to sounding the fundamental, will assist in hearing it in the combination.

23. It is not to be inferred that the overtones are weak because they are difficult to hear; the difficulty is due to the blending. The lower overtones are usually quite prominent in the best qualities of tone. They increase in prominence descending the scale. At below 40 vibrations per second the pitch is quite indefinite owing to the prominence of the lower overtones.

24. *Simple tones* are those free from overtones, and due, therefore, to simple vibrations. Simple vibrations are those without segmental divisions, and are also called pendular vibrations because similar in character to a swinging pendulum.

25. It is nearly impossible to produce tones free of overtones (simple tones). The nearest approach to simple tones is the tone produced by a tuning-fork, the lowest tones of the larger stopped pipes of the pipe-organ, and the lowest tones of a wooden flute.

26. The practical effect of overtones is to give quality or tone-color to sounds. A chord of nature (harmonic series) is a compound of its different tones, just as light is a compound of the seven colors of the rainbow, which blending together in their natural proportion produce white light, but any deviation from this natural proportion produces a shade of color which partakes of the character of the predominating color or colors; so the quality, or tone-color, of tones depends upon the proportionate strength of its various overtones. Decrease in overtones tends toward a dull, hollow, monotonous quality, while increase tends toward a bright, sharp, penetrating quality. The lower overtones tend toward a deep, mellow quality, and the higher overtones toward a thin, metallic quality.

27. The overtones are influenced largely by the character of the string. The harmonic series will extend as high as the thickness and stiffness of the string will permit. Thin flexible strings will naturally vibrate in shorter lengths than thicker and stiffer ones, and thus produce higher overtones. The more elastic the string the stronger all the overtones will be.

28. The overtones are also affected by the manner in which the string is set in motion (whether struck, plucked, or bowed); also, soft broad hammers and picks tend to soften by preventing many of the smaller loops from forming, while hard sharp hammers or picks have the opposite effect—hence the felted hammers of the piano, which are softer and heavier toward the lower tones and harder and lighter toward the higher tones. The force of the blow naturally affects the extent of the harmonic series as well as the strength of all.

29. The place where the string is struck (or otherwise excited) is also very important. No node can form at or very near the point struck, hence all overtones having a node at or very near that point will be missing; thus, if we strike the string at its middle point, all the even numbered harmonics will be missing, producing a hollow, nasal twang. If we strike the string at one-third its length, every third harmonic will be missing. If we strike the string at one-fourth its length, every fourth harmonic will be missing, and so on; and of the harmonics which remain, those are naturally the strongest which have the striking point midway between their nodes, the others being more or less modified. On the other hand, if we touch a vibrating string at any point, thus forming a node instead of a loop, we damp all the harmonics which have no node at that point, while those having a node at that point will remain.

30. Observe, from Fig. 29, that the harmonic series from the 7th up is inharmonic, as the overtones by their closeness

begin at this point to form dissonant intervals with those nearest. However, the inharmonic part of the series is largely, though not wholly, drowned in the more prominent harmonic lower part; so that the harmonic series is in the main harmonic.

31. In pianos the strings are struck by the hammers at between one-seventh and one-ninth of their length, thus destroying the 7th, 8th, and 9th harmonics (6th, 7th, and 8th overtones). The higher overtones, being weak and having nodes within the influence of the stroke, are practically destroyed also.

32. By thus removing the inharmonic part, the harmonic series is made more perfectly harmonic as well as more clearly defined (being within definite limits), as shown in Fig. 30. This is all of the harmonic series (chord of nature) that is of practical use or application to music. (Of course this same series of intervals belongs to any fundamental tone, differing only in pitch.)

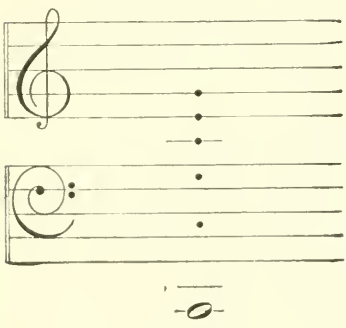


Fig. 30.

33. In Fig. 30 we observe that we have three C's, two G's, and one E, and that we have the major triad—C, E, G—direct on the second octave of the fundamental. Also, observing the successive intervals from the fundamental up, we have the octave, perfect 5th, perfect 4th, major 3d, and minor 3d, by which we observe the relative prominence of these intervals in the music scale.

34. We also notice that the second octave is subdivided into a perfect 5th plus a perfect 4th; and that the perfect 5th above is similarly subdivided into a major 3d plus a minor 3d. The entire harmonic series being thus a series of diminishing similar subdivisions indefinitely extended.

35. Observe that any harmonic series limited to the fifth overtone, as in Fig. 30, consists of three distinct notes (or letters), which, when sounded together, form a major triad; and the root of the triad is naturally the tone from which the triad is derived. The major triad is the only chord that has thus a root in the sense that a plant has a root. In the other triads the word "root" is used more in the sense of ground note, or lowest note, upon which the triad is built in 3ds.

36. Major triads are also called harmonic triads, because thus in perfect harmony with the harmonic series of their fundamental root notes; to which fact is evidently due their greater relative importance. The fundamental note of the series from which a chord is derived is called the fundamental bass of the chord in distinction from the common bass, or lowest written note.

37. It is most convenient and usual to regard a minor triad as a major triad with an intruding 3d; but by taking each note in turn as the intruding note, the minor triad may be regarded as derived from any one of three different harmonic series.

38. Taking the minor triad, E, G, B, Fig. 31, for example, we see that the two lower notes belong to the harmonic series on C, the outside notes belong to the series on E, and the two upper notes belong to the series on G; so that in this sense the minor triad has three distinct but imperfect roots, or fundamental basses (regarding each note of the triad in turn as the intruding note). We see that the minor triad has no perfect root with which all three of its notes harmonize. We notice that these three imperfect roots together form the major triad, C, E, G; the

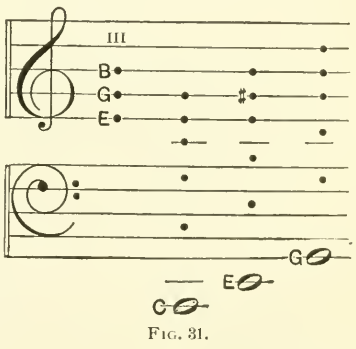


Fig. 31.

middle root E, being the same letter as the lowest note of the minor triad, is the usually accepted root, as it conforms to the simple uniform method of treating all chords as built in 3ds on the lowest note as root; but all three roots may be taken interchangeably as the fundamental bass of the triad. All minor triads being built alike may be analyzed with similar results. We see that every minor triad is directly related to the major triad formed by its three roots.

39. In Fig. 32 the diminished and augmented triads are analyzed. In either case, the outside notes, not forming a perfect 5th, cannot both belong to the same harmonic series, so that these triads have two imperfect roots, or fundamental basses, instead of three (regarding the upper and lower notes in turn as the intruding note).

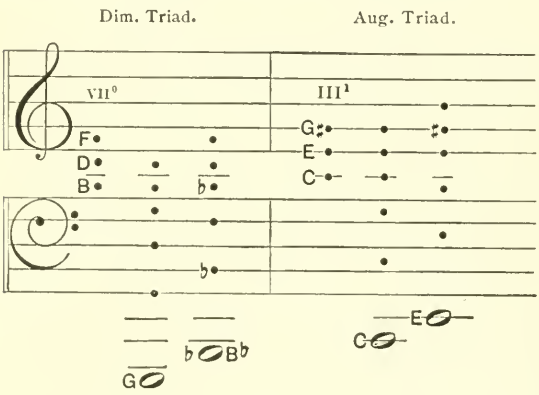


Fig. 32.

40. Observe that the roots of the diminished triad, B, D, F, are G and B♭, neither of which belongs to the triad; for which reason it is frequently treated as a dominant 7th chord with root omitted.

41. The roots of the augmented triad, C, E, G♯, are C and E, both of which belong to the triad; but C being also the lowest note of the triad is the usually accepted root.

42. The 7th chords (see outline on p. 69) mostly receive their justification from the triads on which they are based (see exception, chord of added 6th, p. 73).

43. The harmonic 7th chord consists of a major triad with

the 7th harmonic added; but the 7th harmonic is not exactly represented by any tone of the scale in common use (see Fig. 29, p. 151); its nearest representative is the minor 7th. The V_7 chord being the only chord with major triad and minor 7th is therefore the nearest representative of the harmonic 7th chord, and may be regarded as a slightly defective harmonic 7th chord, hence the prominence of the V_7 chord.

44. The VII°_{7} and $\underline{VII}^{\circ}_{7}$ chords may be regarded as V_9 chords with root omitted (see p. 72 : 22), for the same reason that the VII° triad (Fig. 32) may be regarded as a V_7 chord with root omitted.

45. We see that the harmonic series is the foundation of harmony, or chord formation.

THE SCALE OF NATURE

1. In Fig. 33 we have the harmonic series (chord of nature) on C, including the fourth C; and on the G thus obtained we have based another series. The figures of the first series show the divisions of the string and therefore the comparative rate of vibration of the different tones of that series. The figures of the second series are practically a continuation of the first, being based on G, which has three times the vibrations of the first base; therefore each interval of this series will have three times the vibrations of the corresponding interval of the first series (the series of intervals in both being the same, differing only in pitch).

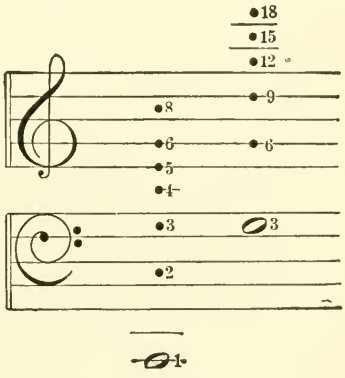


FIG. 33.

2. Between 1 and 2 we have the interval of an octave, the ratio of which (1 : 2) is 2. Between 2 and 3 we have a per-

fect 5th, the ratio of which (2 : 3) is $\frac{3}{2}$. Between 3 and 4 we have a perfect 4th, the ratio of which (3 : 4) is $\frac{4}{3}$. Between 4 and 5 we have a major 3d, the ratio of which (4 : 5) is $\frac{5}{4}$. Between 5 and 6 we have a minor 3d, the ratio of which (5 : 6) is $\frac{6}{5}$. Between 3 and 5 we have a major 6th, the ratio of which (3 : 5) is $\frac{5}{3}$. Between 5 and 8 we have a minor 6th, the ratio of which (5 : 8) is $\frac{8}{5}$. Between 8 and 9 we have a major 2d, the ratio of which (8 : 9) is $\frac{9}{8}$. Between 8 and 15 we have a major 7th, the ratio of which (8 : 15) is $\frac{15}{8}$. In the same way we find the ratio between any two tones by dividing the number of vibrations in the higher tone by the number in the lower tone, and if necessary reducing the resulting fraction to its lowest terms.

3. We have here the ratios of all the natural intervals of both the major and minor diatonic scales by simply arranging them in the order of the interval numbers, as follows:

	n	$\frac{9}{8}$n	$\frac{5}{4}$n	$\frac{4}{3}$n	$\frac{3}{2}$n	$\frac{5}{3}$n	$\frac{15}{8}$n	2n
Major Diatonic scale—	C	D	E	F	G	A	B	C
	n	$\frac{9}{8}$n	$\frac{6}{5}$n	$\frac{4}{3}$n	$\frac{3}{2}$n	$\frac{8}{5}$n	$\frac{15}{8}$n	2n
Minor Diatonic scale—	C	D	E♭	F	G	A♭	B	C

(Beginning with A and sharping G will also give the minor scale.)

FIG. 34.

4. Letting n represent the number of vibrations in C, we may obtain the number of vibrations of any degree of the scale by multiplying n by the corresponding ratio. A scale based thus upon the laws of natural proportions (as derived from vibrating strings) is called a *scale of nature*.

5. We may assume a long wire with sufficient tension to allow it to vibrate once per second. Though no sound is produced, we may call this imaginary note C; one-half the length of the wire will give two vibrations per second, one-fourth will give four vibrations, one-eighth will give eight vibrations, one-sixteenth will give sixteen vibrations per second (the lowest sound). At the sixth subdivision (sixth

octave from the starting C) we get 64 vibrations per second, corresponding to the lowest degree given in Fig. 35.

6. Now, multiplying 64 by the different interval ratios already found, and shown on the left in the figure, we get the number of vibrations in each degree of the first octave. Each octave may be built in the same manner or by simply doubling the numbers in the octave below successively.

7. In forming the minor scale we would only have to substitute the ratios of the minor 3d and 6th ($\frac{6}{5}$ and $\frac{8}{5}$) instead of the major 3d and 6th ($\frac{5}{4}$ and $\frac{5}{3}$).

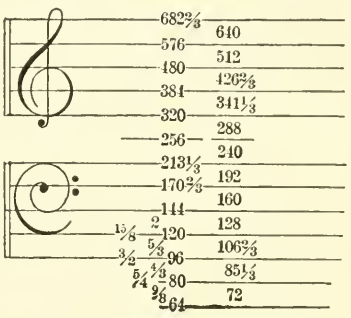


Fig. 35.

8. The standard of pitch given in Fig. 35 (middle C 256) is called *philosophical* or *physical pitch*, because it is based on a simple physical process, as shown above. It is also called *classical pitch*, because it is the average standard used by the classical composers. *Concert pitch* is a higher standard of pitch. The standard also varies in different countries.

9. The tendency of manufacturers of musical instruments has been to raise the standard of pitch, to secure greater brilliancy; so that middle C varies in different standards from 256 to about 270 vibrations per second.

10. In Fig. 34, n represents the number of vibrations in C. We may let $n = 1$, as in Fig. 36. The relationships involved are thus made to stand out alone.

Vibration values—	1	$\frac{9}{8}$	$\frac{5}{4}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{5}{3}$	$\frac{15}{8}$	2
Diatonic scale—	C	D	E	F	G	A	B	C

Consecutive ratios—$1 \times \frac{9}{8} \times \frac{10}{9} \times \frac{16}{15} \times \frac{9}{8} \times \frac{10}{9} \times \frac{9}{8} \times \frac{16}{15} = 2$

Fig. 36.

11. The fractions above the scale letters are the ratios of the intervals from C (as derived from the harmonic series,

Fig. 33), and represent the vibration value of each letter as compared with that of C. The fractions below the letters are the ratios of the intervals between consecutive letters: thus, the ratio D : E is $\frac{8}{9} : \frac{5}{4} = \frac{10}{9}$; or, E : F is $\frac{5}{4} : \frac{4}{3} = \frac{16}{15}$; etc.

12. Observe that the lower fractions multiplied together are equal to the octave, and that the vibration value of each interval from C is equal to the product of all the ratios up to that point. Descending the scale is the reverse of ascending; therefore inverting the ratios will give the successive divisors from right to left.

13. Owing to the constantly increasing rate of vibration ascending the scale, it is evident that the same interval will vary as to number of vibrations with pitch, so that intervals cannot be represented (except locally) by vibration differences. The simplest method, therefore, of expressing intervals is by ratios, since the ratio of any interval does not vary with pitch. Ratios are thus general in character, enabling us to express intervals, or pitch differences, in a general sense.

14. Besides, it may be shown that multiplying by ratios gives the same result as adding differences. Taking any two numbers for example, as 3 and 4, thus: $4 - 3 = 1$ = difference; $\frac{4}{3} = 1\frac{1}{3}$ = ratio. Now, multiplying 3 by the ratio $1\frac{1}{3}$ is merely adding $\frac{1}{3}$ of itself, or 1, which is the difference. Therefore the common conception of the music scale as a succession of intervals one above the other (the whole being naturally the sum of all its parts) is in no sense affected. Hence, to add intervals we multiply their ratios; and conversely, we subtract by dividing.

15. Observe in the lower ratios in Fig. 36 that there are only three different kinds of ratios used: $\frac{9}{8}$, called major tone, $\frac{10}{9}$, called minor tone, and $\frac{16}{15}$, called major semitone. Observe also that the octave consists of three major tones, two minor tones, and two major semitones. If we take the difference ($\div$) between the major 3d ($\frac{5}{4}$) and minor 3d ($\frac{6}{5}$), thus, $\frac{5}{4} \div \frac{6}{5} = \frac{25}{24}$,

we get the minor semitone. We may notice that the major and minor semitones added ($\times$) give the minor tone ($\frac{16}{15} \times \frac{25}{24} = \frac{10}{9}$).

16. We may sharp or flat any tone by multiplying or dividing its ratio either by $\frac{25}{24}$ or $\frac{16}{15}$. Using $\frac{25}{24}$ we get the enharmonic scale of 21 notes to the octave. Using $\frac{16}{15}$ we get the enharmonic scale of 17 notes to the octave. Both are shown in Fig. 37.

1	$\frac{25}{24}$	$\frac{27}{25}$	$\frac{9}{8}$	$\frac{75}{64}$	$\frac{6}{5}$	$\frac{5}{4}$	$\frac{125}{96}$	$\frac{32}{25}$	$\frac{4}{3}$	$\frac{25}{18}$	$\frac{36}{25}$	$\frac{3}{2}$	$\frac{25}{16}$	$\frac{8}{5}$	$\frac{5}{3}$	$\frac{125}{72}$	$\frac{9}{5}$	$\frac{15}{8}$	$\frac{125}{64}$	$\frac{48}{25}$	2
C	C♯	D♭	D	D♯	E♭	E	E♯	F♭	F	F♯	G♭	G	G♯	A♭	A	A♯	B♭	B	B♯	C♭	C
1.0000	1.0417	1.0800	1.1250	1.1719	1.2000	1.2500	1.3022	1.2800	1.3333	1.3888	1.4400	1.5000	1.5625	1.6000	1.6666	1.7361	1.8000	1.8750	1.9531	1.9200	2.0000

1	$\frac{16}{15}$	$\frac{135}{128}$	$\frac{9}{8}$	$\frac{6}{5}$	$\frac{75}{64}$	$\frac{5}{4}$	$\frac{4}{3}$	$\frac{64}{45}$	$\frac{45}{32}$	$\frac{3}{2}$	$\frac{8}{5}$	$\frac{75}{48}$	$\frac{5}{3}$	$\frac{16}{9}$	$\frac{225}{128}$	$\frac{15}{8}$	2
C	C♯	D♭	D	D♯	E♭	E	F	F♯	G♭	G	G♯	A♭	A	A♯	B♭	B	C
1.0000	1.0666	1.0547	1.1250	1.2000	1.1719	1.2500	1.3333	1.4222	1.4062	1.5000	1.6000	1.5625	1.6666	1.7777	1.7586	1.8750	2.0000

Fig. 37.

17. The ratios are also given decimally for more convenient comparison, from which it is seen that in the upper scale E♯ is higher than F♭, and B♯ than C♭ (the sharps and flats at these points overlapping); and that in the lower scale the results are all overlapping ($\frac{16}{15}$ being greater than a half-tone), and the tones between E and F and between B and C are eliminated ($\frac{16}{15}$ being the exact interval between these notes).

18. We see that in the scale of nature there is a difference between the sharp of one tone and the flat of the tone next above, and also that there is a great lack of uniformity in the intervals of the scale as shown by their ratios.

19. If these intervals were equal, transposing or modulating to different keys would be merely a shifting of the scale (all the intervals coinciding in each change); but in view of the lack of uniformity shown above, transposing or modulating would greatly increase the number of tones involved, were

all the keys to be exact (some of the tones would coincide, but the majority would not).

20. The violin and the voice are capable of making these changeable intervals; but the inadaptability of the scale of nature to keyed instruments (as the piano) is very apparent.

21. The different methods of overcoming this difficulty are called *Temperaments.*

EQUAL TEMPERAMENT

1. The scale in common use is called the *Equal Temperament Scale,* because the octave is divided into twelve equal parts called semitones, or half-steps, thus conforming to the piano keyboard, which contains twelve keys (seven white and five black) to each octave.

2. Equal Temperament removes the distinction between major and minor tones and semitones, and also between sharps and flats (the same black keys being used for both). The enharmonic scale (a scale containing intervals smaller than a half-step) is thus changed to the chromatic scale (consisting of half-steps), and the enharmonic change (see p. 41 : 13) becomes a mere change of name.

3. Since the octave (2) is divided into 12 equal semitones we may correctly regard the octave either as 12 semitones (s) added, thus, $s+s+s+s+s+s+s+s+s+s+s+s=12s$, or as 12 semitones multiplied, thus, $s\times s\times s\times s\times s\times s\times s\times s\times s\times s\times s\times s=s^{12}$; for, as already shown (p. 160: 14), multiplying ratios is equivalent to adding differences. We must bear in mind, however, that the semitones are equal only in tone value, but not in number of vibrations, as the number of vibrations in any interval varies with pitch.

4. Regarding the octave as 12 semitones multiplied together, therefore, the semitone ratio is that ratio which multiplied by itself 12 times equals the octave (2), or the 12th root of 2 ($\sqrt[12]{2}=1.05946=\frac{53}{50}$ nearly); but for the sake of

simplicity, let s represent the ratio of the semitone. The chromatic scale will then be represented thus:

Vibration values —1	s^1	s^2	s^3	s^4	s^5	s^6	s^7	s^8	s^9	s^{10}	s^{11}	$s^{12}=2$
Chromatic scale —C	C♯	D	D♯	E	F	F♯	G	G♯	A	A♯	B	C
Consecutive ratios—1	$\times s$	$\times s$	$\times s$	$\times s$	$\times s$	$\times s$	$\times s$	$\times s$	$\times s$	$\times s$	$\times s$	$\times s=2$

Dropping the sharp tones, the diatonic scale will be thus:

Vibration values —1		s^2		s^4	s^5		s^7		s^9		s^{11}	$s^{12}=2$
Diatonic scale —C		D		E	F		G		A		B	C
Consecutive ratios—1	$\times$	s^2	$\times$	$s^2\times s$		$\times$	s^2	$\times$	s^2	$\times$	$s^2\times s$	$=2$

FIG. 38.

5. We see that each vibration value is the product of all the ratios up to that point (see p. 160: 12).

6. As the semitone (s) is the common unit of measure, and as the exponent of s in each vibration value shows the number of times s is used as a ratio, therefore the exponents (as showing the number of semitones contained) are the measures of the intervals; thus, a major 2d is 2 semitones (s^2), a major 3d is 4 semitones (s^4), a perfect 4th is 5 semitones (s^5), etc.

7. It would appear, perhaps, that the number of semitones should be expressed by coefficients, thus, $2s$, $4s$, $5s$, etc., instead of by exponents, thus, s^2, s^4, s^5, etc. The explanation of this is that the semitone is expressed in the form of a ratio, and not in the form of a difference.

8. Observe that (by the algebraic rules of involution and evolution) we multiply by adding exponents, divide by subtracting, raise powers by multiplying, and extract roots by dividing; thus, $s^2 \times s^3 = s^{2+3} = s^5$; $s^7 \div s^5 = s^{7-5} = s^2$; $(s^3)^4 = s^{3\times 4} = s^{12}$; $\sqrt[6]{s^{12}} = s^{12\div 6} = s^2$; so that the exponents of s are compared (added, subtracted, etc.) exactly as if they were coefficients.

9. The exponents of s may also be called logarithms. A logarithm of any number is the exponent of the power to which it is necessary to raise a fixed number (called the base) to produce the given number. In Fig. 38 the log. of G (perfect

5th) is 7, the log. of E (major 3d) is 4, etc. (on s as a base).

10. We find these exponents, or logarithms, sufficient in comparing intervals of the tempered scale with each other. However, in comparing the tempered scale with the scale of nature, it is necessary to use a common system of logarithms.

11. A general table of logarithms (the computation of which belongs to algebra) gives the logarithms of all numbers up to a certain point, on an assumed base (usually 10), giving also the decimals involved in all intermediate numbers (between exact powers), usually to five or six places of decimals, so that incommeasurable numbers are thus made sufficiently commeasurable for comparison.

12. The value of a logarithmic table consists in its enabling us to multiply by adding, divide by subtracting, and especially to raise powers by multiplying and extract roots by dividing.

13. The ordinary process in using the table consists in first finding the log. of the given number, then adding, subtracting, multiplying, or dividing, as the case may require; then find the number corresponding to the resulting log. However, our use of the logarithms here is only as a basis of comparison, since they are the exponents of a common unit of measure (10), and, as already shown, may be compared (added, subtracted, etc.) as if coefficients.

14. The log. of 1 ($10^1 \div 10^1 = 10^{1-1} = 10^0$, but any number divided by itself = 1, therefore $10^0 = 1$) is 0, and the log. of 10 ($10^1 = 10$) is 1; therefore the log. of any number between 1 and 10 is between 0 and 1, and therefore wholly decimal. As the interval ratios within the octave are between 1 and 2, their logs. will be wholly decimal.

Logarithms of the ratios of the intervals of the Scale of Nature.	0.	.05115	.09691	.12494	.17609	.22185	.27300	.30103
Scale—	C	D	E	F	G	A	B	C
Logarithms of the ratios of the intervals of the Tempered Scale.	.0	.05017	.10034	.12543	.17560	.22577	.27594	.30103

FIG. 39.

15. The upper logs. in Fig. 39 are taken from a logarithmic table and are the logs. of the ratios of the scale of nature (subtracting the log. of the denominator from the log. of the numerator where fractions are involved, since we divide by subtracting).

16. To find the lower logs. we first divide the log. of the octave (.30103) by 12 (since we extract roots by dividing), thus, .30103 ÷ 12 = .02509 = log. of semitone; now, multiplying (since we raise powers by multiplying) the log. of the semitone by the number of semitones in each interval of the tempered scale, we get the log. corresponding to each.

17. The log. of any interval not given in Fig. 39 may be found by taking the difference between the logs. of those letters between which it is found. Thus, between E and G is a minor 3d, the log. of which (.17609—.09691) is .07918 in the scale of nature, and (.17560—.10034, or .02509 × 3) .07527 in the tempered scale.

18. We have now a basis of direct comparison between the scale of nature and the tempered scale, by which we may determine the amount of deviation of each interval of the tempered scale from true pitch. Thus, the difference between the logs. of G (perfect 5th) is .17609 − .17560 = .00049; dividing by the log. of the semitone (.02509), we have $\frac{49}{2509} = \frac{1}{51}$ nearly: therefore the perfect 5th is about $\frac{1}{51}$ of a semitone flat (the log. of the tempered G being the lower). The perfect 4th (inverted perfect 5th) will of course be $\frac{1}{51}$ of a semitone sharp. This deviation from true pitch is scarcely perceptible, and therefore the 4th and 5th are classed with the octave and called perfect intervals.

19. Comparing the logs. of the other intervals, we would find them more perceptibly out of tune, as follows: major 3d, about $\frac{1}{7}$ *s* sharp; minor 6th (inverted major 3d), $\frac{1}{7}$ *s* flat; minor 3d, $\frac{1}{6}$ *s* flat; major 6th (inverted minor 3d), $\frac{1}{6}$ *s* sharp; major 7th, $\frac{1}{8}$ *s* sharp; minor 2d (inverted major 7th), $\frac{1}{8}$ *s* flat. The whole tone has a double value in the scale of nature:

major (ratio $\frac{9}{8}$) between C and D, F and G, and A and B (log. .05115); and *minor* (ratio $\frac{10}{9}$) between D and E, and G and A (log. .04576). In the tempered scale its log. is .05017, which is about $\frac{1}{2}\frac{1}{5}$ *s* flat as compared with the *major*, but about $\frac{1}{6}$ *s* sharp as compared with the minor tone. The major 2d is therefore $\frac{1}{2}\frac{1}{5}$ *s* flat compared with the *major* tone, or $\frac{1}{6}$ *s* sharp compared with the *minor* tone; the inversion (minor 7th), in either case, being the opposite. Our ears have become so accustomed to the tempered scale that we do not notice the slight deviations from true pitch.

20. By means of the fractions thus found we may easily find the value of the true intervals in semitones; thus, from C to D is a major 2d (2 *s*) and $\frac{1}{2}\frac{1}{5}$ *s* flatter than the true major tone, therefore the true major 2d is $\frac{1}{2}\frac{1}{5}$ *s* sharper ($\frac{1}{2}\frac{1}{5}$ = .04) or 2.04 *s*. From C to E is a major 3d (4 *s*) and $\frac{1}{7}$ *s* sharper than the true major 3d, therefore the true major 3d is $\frac{1}{7}$ *s* flatter ($\frac{1}{7}$ = .14) or 4 *s* − .14 *s* = 3.86 *s*. From C to F is a perfect 4th (5 *s*) and $\frac{1}{5}\frac{1}{1}$ *s* sharp ($\frac{1}{5}\frac{1}{1}$ = .02); the true perfect 4th is therefore 5 *s* − .02 *s* = 4.98 *s*. From these the others may be found; thus, C − F = G (see table), F + E = A and G + E = B: or, the difference between the values of any two intervals is the value of the interval between; or, the sum of the values of any two intervals is the value of the interval of their sum. This gives the values to within one-hundredth part of a semitone, which is much beyond the limit of sensible error, as $\frac{1}{5}\frac{1}{0}$ *s* is regarded as the sensible limit.

	True Intonation	Equal Temperament
	Semitones	Semitones
C	12.00	12.00
B	10.88	11.00
A	8.84	9.00
G	7.02	7,00
F	4.98	5.00
E	3.86	4.00
D	2.04	2.00
C	0	0

21. In this way we get a more definite conception of the comparative values of the true and tempered intervals.

CONSONANCE

1. Naturally, the closer any two tones are related the more consonant the interval between. The relationship between any two tones depends in the *first* place upon the frequency of the blending of their overtones. In Fig. 40 we have the different consonant intervals within the octave compared in this respect:

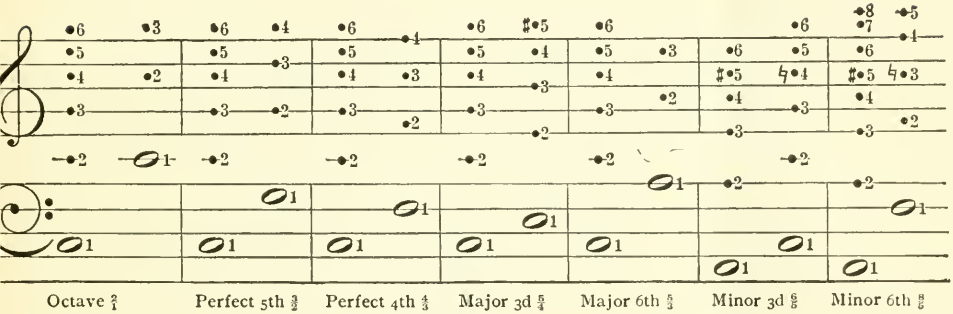


FIG. 40.

2. Observe, in each case, that the frequency of the blending of overtones is in exact accord with the ratio of the interval; thus, in the octave (ratio $\frac{2}{1}$) every harmonic of the upper note blends with every second harmonic of the lower note, in the perfect 5th (ratio $\frac{3}{2}$) every second harmonic of the upper note blends with every third harmonic of the lower note, and similarly as to the other intervals. If we were to extend each series indefinitely we would find the rule continuing to hold true.

3. These blending overtones mutually reinforce each other, the amplitude of the resulting vibration being practically equal to the sum of the amplitudes of the separate vibrations; and since the intensity of sound is proportional to the square of the amplitude, therefore the intensity of the blending overtones is equal, not to the sum, but to the square of the sum of the separate intensities. This gives the blending overtones special prominence.

4. Observe, in Fig. 40, that in each interval the ratio of the number of harmonics in each series up to any blending point (reduced if necessary) is the ratio of the interval, or the vibration numbers of any two blending overtones (put into the form of a fraction and reduced when necessary) gives the ratio of the interval; or, if we regard the blending overtones as dividing the series into sections, we again see the ratio of the interval duplicated in each section in the ratio of the number of harmonics on each side.

5. We also notice that the remoteness of the first two blending overtones is also a measure of relationship.

6. Observe that in the octave the upper note with all its overtones blends with overtones of the lower note, the two notes thus blending into one without adding any new element, the effect being merely to brighten the lower note by strengthening every other overtone; hence octaves are regarded as replicates of the same tone, as no new element is involved.

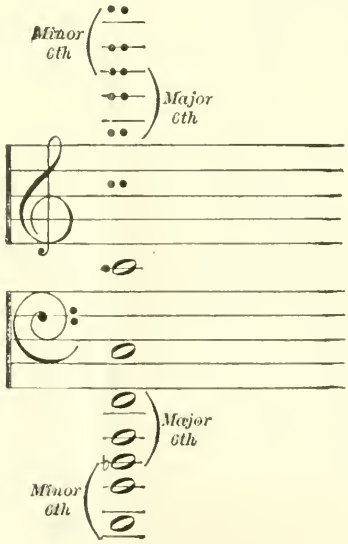


Fig. 41.

7. Similarly the interval of a perfect 12th (octave + perfect 5th) adds no new element, as every harmonic of the upper note blends with every third harmonic of the lower note. The same applies to any interval which corresponds to the interval between the lower note and any one of its harmonics.

8. If in Fig. 40 we were to extend each series indefinitely, we would find that in each interval the blending overtones form in themselves a harmonic series, as their vibration numbers are 1, 2, 3, 4, etc., times the number of the lowest blending overtones.

9. If we were to arrange the intervals in the form of a downward harmonic series, as in Fig. 41, the double notes would show the blending overtones of each separate interval. (The 7th harmonic, which is omitted in Fig. 41, as it does not belong to the scale, may be included.) By extending Fig. 41 sufficiently we may include also the dissonant intervals, as the principle holds good for all intervals.

10. The relationship between any two tones depends in the *second* place upon the frequency of the blending of their vibrations. In the octave every vibration of the lower tone blends with every second vibration of the upper tone as indicated by the ratio $\frac{2}{1}$; thus, | | | | | | | | . (The spaces between the marks represent the comparative duration of the vibrations.) In the perfect 5th (ratio $\frac{3}{2}$) every second vibration of the lower tone and every third vibration of the upper tone blend; thus, | | | | | | | | . Similarly, in the perfect 4th (ratio $\frac{4}{3}$) every third vibration of the lower tone blends with every fourth vibration of the upper tone. In the major 3d (ratio $\frac{5}{4}$) every fourth blends with every fifth. In the minor 3d (ratio $\frac{6}{5}$) every fifth blends with every sixth. In the major 6th (ratio $\frac{5}{3}$) every third and fifth blend. In the minor 6th (ratio $\frac{8}{5}$) every fifth and eighth blend. In the major 2d (ratio $\frac{9}{8}$) every eighth and ninth blend. In the major 7th (ratio $\frac{15}{8}$) every eighth and fifteenth blend.

11. We see that the ratio of any interval is duplicated, both in the blending of the overtones and in the blending of the vibrations, and therefore the whole may be summed up in the general rule, that *the consonance of intervals* (and therefore the relationship of the including tones) *is proportional to the simplicity of their ratios.* We naturally conclude that simplicity is the essential element of consonance, and that the ratio of any interval is its characteristic stamp by which the same interval always gives the same impression as to degree of simplicity regardless of pitch.

12. The blending overtones only blend perfectly when in perfect unison; and they are only in perfect unison when the interval between the generating tones is just (in accord with the scale of nature). But in the tempered scale all the intervals (except the octave) are slightly false, and hence the blending overtones do not blend perfectly, but sufficiently to still clearly define the interval; and the effect, if perceptible, is only a sense of inaccuracy. For, as already seen (p. 168: 4), the ratio of any interval is duplicated, not only in the blending vibrations of the tones forming the interval, but also in the frequency of blending overtones, in the harmonics as a whole up to any blending point, and in the harmonics of each section separately; so that thus the true ratio of the interval is clearly defined, even though the interval itself should be slightly false. There could be no sense of inaccuracy without a sense of the true interval as a basis of comparison.

13. Observe that all the consonant intervals of the scale of nature are a natural selection of those having the simplest ratios, and therefore most consonant.

BEATS

1. Sound-waves (p. 147: 4) increase in length as they diminish in number, for what is lacking in number must be made up in length, since all sounds travel the same distance in the same time.

2. When two notes of different pitch are sounded together, the longer waves of the lower note steadily gain on the shorter waves of the upper note; and the gain per second will equal the difference in the number of waves or vibrations per second in the two notes.

3. It is evident that the reverse phase of each wave gained must be met, while at other times both waves move in the same direction, so that they will alternately coincide and oppose. When they coincide they strengthen each other and

increase the sound; when they oppose they counteract each other and diminish or entirely destroy the sound; thus producing an alternate swell and lull, which are called **Beats.**

4. The number of beats per second produced by any two notes sounding together is equal to the difference in the number of vibrations per second of the two notes.

5. **Imperfect Unison Beats.** Tones in perfect unison do not beat, as their vibrations coincide; but an imperfect unison is marked by distinct beats, which increase in rapidity with increase of error. This is very important in tuning instruments; thus, to tune two notes to a perfect unison it is only necessary to gradually bring them together till they cease to beat.

6. Beats which are due to imperfect unison are called *Imperfect Unison Beats.*

7. Beats may occur between overtones, which are therefore called *overtone beats,* while the beats between the prime tones are called *prime beats.* Prime beats and overtone beats often occur at the same time, producing more or less confusion.

8. Though on the one hand beats increase in number with increase of interval, on the other hand they rapidly decrease in strength with increase of interval (the reason is given under "Sympathetic Resonance"); therefore, overtone beats are sometimes stronger than the prime beats by reason of a closer beating interval.

9. **Imperfect Consonance Beats.** Wide-apart consonances (as octaves, perfect 5ths, perfect 4ths, etc.) when slightly false also produce distinct beats, which are called *Imperfect Consonance Beats,* and which also increase in rapidity with increase of error.

10. These are due in the first place to the imperfect unison beats of the lowest blending overtones. When an interval is slightly false, all the blending overtones become imperfect unisons, and therefore beat because of their imperfect blending. Of course the beats of the lowest blending over-

tones are the most distinct and determine the number; but these are strengthened by blending beats of the higher blending overtones.

11. The number of beats in the higher blending overtones are respectively 2, 3, 4, etc., times the number in the lowest blending overtones; and therefore every 2d, 3d, 4th, etc., beats respectively blend with the lowest.

12. The strength of these imperfect consonance beats decreases with decrease in consonance of interval, by reason of the increasing remoteness of the blending overtones (see Fig. 40).

13. It has been shown by experiments that imperfect consonance beats occur when the tones are simple (without overtones); but it has also been shown by resonators (tuned jars which detect corresponding disturbances in the air) that these beats are formed within, and not outside the ear. These, however, correspond in number and therefore blend with and strengthen those formed by the blending overtones (when both exist). The internal beats are called *subjective*, as they have only a subjective existence; while the external beats are called *objective*, as they have an objective existence.

14. Helmholtz explained the subjective imperfect consonance beats on the theory that *simple tones when powerful enough produce overtones within the ear by reason of the peculiarly favorable construction of the ear-drum and connecting parts.* Kœnig claimed that in his experiments no overtones were audible, and explained the beats as *due to the beating of the nearest multiples of the simple tones.* As these multiples correspond to the overtones, the result is the same as if we assumed the actual existence of the overtones. It makes no difference, so far as the sensation (practical fact) is concerned, whether the beats are objective or subjective; and therefore the question as to the relative objective or subjective character of the beats is of no practical (only theoretical) importance.

15. In tuning consonant intervals, as in tuning unisons, it

is only necessary to raise or lower the dissonant note (as the case may require) till it ceases to beat or (in tuning to any degree of temperament) till the number of beats corresponding to the desired degree of temperament is heard. Beats thus furnish the most accurate means of tuning.

16. **Beat Tones.** When the rapidity of the beats exceeds 16 per second, they begin (owing to their regular periodic recurrence) to form a tone, which is therefore called the *beat tone.*

17. As the rapidity increases the beating effect decreases, while the definiteness and pitch of the beat tone increases; but during the transition of the beats into a tone, both beats and tone are heard, since the two different sensations are received by different parts of the ear.

18. As already observed, the strength of beats, and therefore of the beat tone, decreases with increase of interval. But we may increase the number of beats without changing the interval by taking the same interval at a higher pitch, thus raising the pitch of the beat tone; or, on the other hand, we may (ascending the scale) narrow the interval without changing the number of beats, thus increasing the loudness of the beat tone without changing its pitch. Also, the closer the interval, the lower the pitch of the beat tone as compared with its generators, and therefore the more easily heard by contrast. Thus we see that, other things being equal, beat tones increase in prominence ascending the scale.

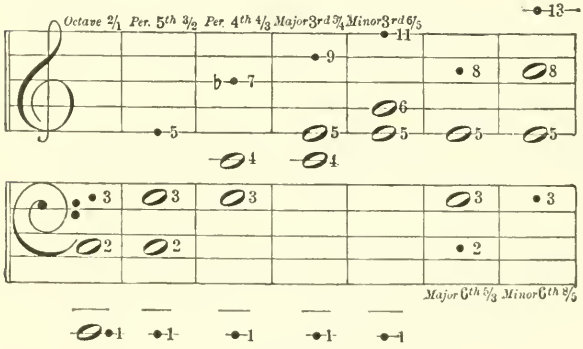
19. If two notes (called generators) are sounded together, beats or beat tones will exist theoretically between all the harmonics of the two series; but taking into account the effect of distance and the tendency of the stronger to absorb the weaker, it naturally results that only the most prominent have audible existence.

20. When two beat tones are of nearly equal intensity, both may be heard at the same time and may in turn beat (if differing slightly in pitch). Also beats and beat tones, due to different parts, are sometimes heard at the same time.

DIFFERENTIAL AND SUMMATIONAL TONES

1. These, like beat tones, are phenomena resulting from sounding two notes together.

2. *Differential* tones have a vibration frequency equal to the difference in the number of vibrations of their generators, hence the name. *Summational* tones have a vibration frequency equal to the sum of the number of vibrations of their generators, hence the name. Summational tones are therefore always higher than both generators; while differential tones are the same in pitch as the lower generator at the octave (the upper generator being double the lower), but lower than both generators when their interval is less than an octave, and between both generators when their interval is greater than an octave.



7, 11, and 13 are only approximate, as their true pitch is not exactly shown by the staff.

FIG. 42.

3. Fig. 42 shows the differential and summational tones for the consonant intervals within the octave. They of course remain relatively the same for each interval, regardless of the position of the interval on the staff. Observe that taking the difference between the generator numerals gives the differential numeral, and adding the generator numerals gives the summational numeral.

4. Summational tones are usually weak and hence are of but little importance. Differential tones, however, are often

distinctly audible, and are the more easily heard the lower they are as compared to their generators.

5. Taking the difference between the generators themselves we get the differential of the first order. Taking the difference between the differential of the first order and either generator we get the differentials of the second order. Taking the difference between the differentials of the second order and either generator, or the differential of the first order, we get differentials of the third order. And so on, theoretically, till the harmonic series from 1 (root of interval) up to the generators is complete, which may then be continued through the overtone differentials and summationals indefinitely.

6. Fig. 43 shows the harmonic series formed by the differential tones of each of the consonant intervals within the octave; but the principle applies similarly to all intervals. The intervals in the figure are arranged in their natural order in the harmonic series, and hence have the same root; and the harmonic series formed in each case is the same as far as it goes. Otherwise, the intervals would have different roots and the differentials would form different harmonic series.

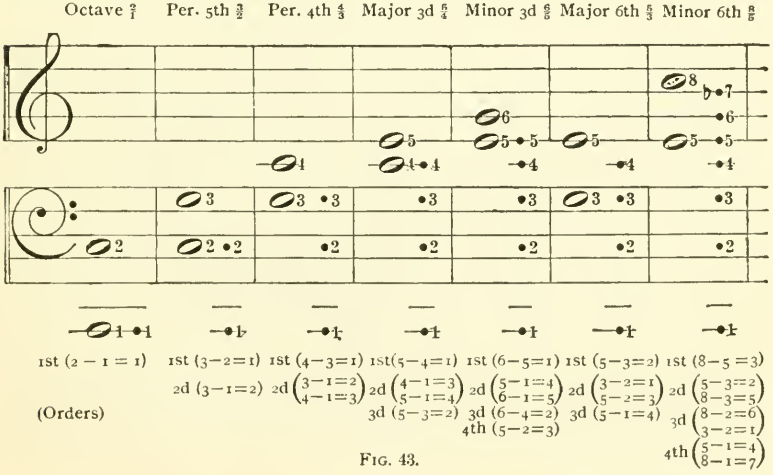


FIG. 43.

7. The different orders of differentials are indicated at the bottom of Fig. 43. It will be seen that the simpler the ratio of any interval the fewer the differentials formed, and therefore the simpler the character of the interval.

8. Fig. 44 shows the interval of a major 3d and the three harmonic series involved, thus showing their relation to each other. The middle series is extended up to the summational tone of the generators.

9. Observe that the summational of the generators expresses also a differential relation indirectly as between either generator and the harmonics of the other, as shown at *a*; or as between the harmonics of each, as shown at *b* and *c*; or directly as between the harmonics above and below each blending point, as shown at *d*; and is thus, in a sense, a focusing point as between the two harmonic series.

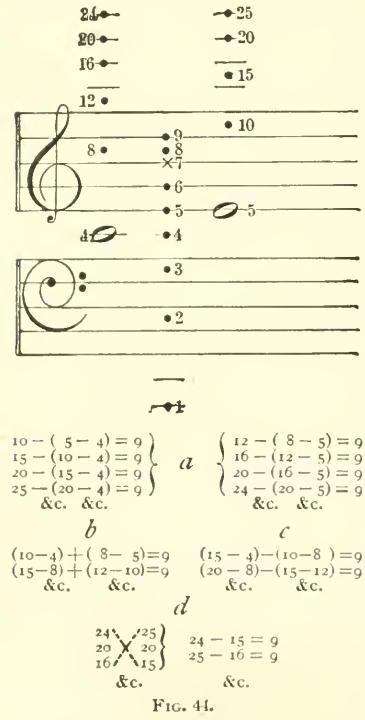


Fig. 44.

10. Also, the summationals of the overtones taken successively, thus, $8 + 10 = 18$, $12 + 15 = 27$, $16 + 20 = 36$, etc., are in like manner higher focusing points; and these focusing points taken together form in themselves a harmonic series, thus, 9, 18, 27, 36, etc., and therefore harmonize and blend together, forming a compound tone.

11. Also the differentials of the harmonics of the generators taken successively, thus, $5 - 4 = 1$, $10 - 8 = 2$, $15 - 12 = 3$, $20 - 16 = 4$, etc., form a harmonic series which is

always built on the first differential (which, however, is not always 1), and if extended high enough will include the summationals. Comparing this series with the series produced by the summationals, we see that they stand to each other, in whole or in part or in any similar combination of parts, in the ratio of the sum and difference of the generators; so that differential and summational tones are, in a sense, complements of each other, and one can scarcely exist without the other.

12. Observe, again, that the summational of the generators is the exact mean between the first overtones; and each summational successively is the exact mean between the even numbered harmonics of the generators. In each case the overtones being of equal rank are equal in strength, supposing the generators are equal. The summationals are also exact means between the differentials of the odd numbered harmonics of one side and the generator of the other; thus,

$$\begin{array}{cc} 15-4=11 & 25-4=21 \\ \text{mean}=9 & \text{mean}=18, \\ 12-5=7 & 20-5=15 \end{array}$$

etc. Evidently an exact mean can only thus be indirectly formed between those harmonics having an uneven difference, since all elastic bodies must vibrate in whole numbers (exact number of parts). Other interesting relations might also be pointed out.

13. These relations are general and apply to all intervals, and therefore have a bearing on the nature of differential and summational tones.

14. The complemental relations between differentials and summationals indicate that they have a common origin; and the relations pointed out indicate that they are the resultant effect of the influence which each generator exerts on the other.

15. Differential tones were discovered about 1745 by Sorge, a German organist, but were made more generally

known by the Italian violinist Tartini, and are often called Tartini's tones. Summational tones were discovered by Helmholtz, about 1854.

16. Helmholtz showed that by mathematical theory, when the amplitude of the vibrations of two generators sounding together is great enough, other vibrations are also produced having a frequency corresponding to the differential and summational tones; and thus developed the theory that differential and summational tones were both due to vibrations produced by the combined action of the generators. He also showed that the construction of the drum skin of the ear and connecting parts is peculiarly favorable for magnifying these tones; so that they are thus produced in the ear even when they are not sensibly produced in the air, and hence are more largely subjective than objective.

17. Previous to Helmholtz's theory and discovery of summational tones, differential tones were generally regarded as due to beats, and therefore identical to beat tones.

18. Helmholtz does not recognize beat tones, evidently regarding them as differential tones. Koenig and others recognize both beat tones and differential tones, but as differing in origin. The fact that audible tones sometimes exist where beat tones would be inaudible by reason of the width of the interval, would also indicate that these tones were due to some other cause than beats. (Differential tones also diminish somewhat with increase of interval.)

19. Beat tones and differential tones both have a vibration frequency equal to the difference in number of vibrations of their generators; therefore, where they both exist as due to the same generators, they coincide, blend, and strengthen each other. This would appear to account for the degree of strength which neither alone would sometimes seem to warrant; especially if we apply the principle that *the intensity of blending tones is proportional to the square of the sum of their separate intensities.*

20. Differential, summational, and beat tones are in general called combinational tones, because produced only by the combination of two or more generating tones. They are thus distinguished from harmonics.

DISSONANCE

1. Beats bear directly on the subject of dissonance. Intervals increase in dissonance with number of beats up to about 33 per second, after which their roughness diminishes as they merge more and more into the beat tone.

2. The number of beats in the major 2d (whole tone) between middle C of 256 vibrations and D of 288 vibrations (288–256) is 32, and hence near the point of greatest dissonance. If taken an octave higher it would contain 64 beats, and the minor 2d (semitone) would contain 32 beats. Or if taken an octave lower it would contain 16 beats, and the major 3d (two whole tones) would contain 32 beats; but here the increase of interval counteracts the effect of the beats, as the audible limit of beats is about a minor 3d, otherwise, any interval if taken low enough would be at the point of greatest dissonance. However, the same interval increases perceptibly in roughness descending the scale till the point of about 33 beats is reached, and *vice versa*.

3. We may regard the interval of the 2d (major or minor, according to pitch) as representing about the maximum degree of dissonance.

4. Observe, in Fig. 40 (p. 167), the interval of a 2d between the second and third harmonics in the perfect 4th and major and minor 6ths, and between the third and fourth harmonics in the perfect 5th and major and minor 3ds. In the perfect 5th, however, it is above the first blending overtones. We observe, also, other more remote dissonant intervals.

5. We see that all intervals (except the octave) contain both a consonant and a dissonant element, and that the dissonant element increases as the consonant element decreases, so

that the boundary between consonance and dissonance is merely a question of predominance. In consonant intervals the consonant element predominates, and in dissonant intervals the dissonant element predominates. Fig. 40 shows only those within the octave that are classed as consonant.

6. Where more than two generators are involved, dissonance is due in a large measure to combinational (especially differential) tones. In Fig. 43 we observe that where only two generators are involved the differentials belong to the same harmonic series with the generators and therefore form consonant intervals with them (except in the higher parts, see 7, in the case of the minor 6th). But if we had three or more instead of two generators, they would form three or more different intervals with each other, and unless these intervals were in their natural harmonic order (as only in the major triad) the differentials of each interval would form separate harmonic series, which would form a greater or less number of dissonant intervals with each other (producing beats); but naturally the more harmonic the combination of the generators the fewer the dissonant intervals produced by their differentials.

7. If Fig. 43 were extended to include the dissonant intervals, we would find that the differentials soon begin to form dissonant intervals with the generators.

8. In Fig. 42 we see that the summational tones form dissonant combinations with the generators, except in the octave, perfect 5th, and major 6th; but as summational tones are generally weak, if audible at all, they may usually be disregarded.

SYMPATHETIC RESONANCE

1. *Sympathetic Resonance* is the tendency of any resonant body to vibrate in sympathy when a note is sounded near it having a vibration frequency corresponding to its own.

2. The sympathetic vibration is produced by the repeated strokes of the vibrations of the sounding body being transmitted to the sympathizing body. The effect, however, is not instantaneous, as the first stroke in itself is not sufficient, but must be magnified by repetition; just as to ring a very heavy bell requires repeated pulls on the rope at regular, rightly timed, periodic intervals before the bell begins to ring. The principle in each case is exactly the same.

3. Strings are very sympathetic when attached to a sounding-board (as in the piano) or a sounding-box (as in the violin or guitar); but the strings themselves have not sufficient surface to receive direct very much of the force of the transmitted strokes.

4. If we were to sing a note into a piano against the sounding-board (after raising the dampers) we would hear the note repeated by the instrument (the note should be sustained for a time to obtain a good result). The vibrations of the voice striking the sounding-board are transmitted by it to the strings; and those strings having a corresponding vibration frequency will vibrate in sympathy. If the note sung represents a compound tone (containing overtones), then all those strings which are capable of sounding the whole or any part of the compound tone will sound proportionately. Thus the piano is, in a measure, capable of analyzing the compound tone.

5. Light and pliable bodies, such as strings, membranes, and enclosed air, being easily movable, are easily set into sympathetic vibration, which, however, as readily die away when the cause ceases. On the other hand, heavy or rigid bodies, as bells, tuning-forks, etc., respond less readily, and require a greater number and more accurately timed strokes and therefore longer sustained effort to produce sympathetic vibrations, which, however, die away as slowly as they are produced.

6. Easily sympathetic bodies may be made to vibrate by

tones which do not exactly correspond in vibration frequency (pitch), but the amplitude of the vibrations diminishes as the difference in pitch increases; and naturally the more easily sympathetic a body is, the greater the limit of difference in pitch by which it can be influenced.

7. The ear is wholly a sympathetic instrument. The end of every fibre of the auditory nerve is connected with small elastic appendages which vibrate sympathetically with the sound-waves. Each of these elastic appendages corresponds to a certain pitch of tone, but, being extremely sympathetic, is influenced within certain limits of pitch on either side; the sensible limit being ordinarily somewhat more than a semitone on either side, or together about a minor 3d.

8. A string or other easily sympathetic body, intermediate in pitch between two sounding bodies within influencing distance, will be made to beat by being set in sympathetic vibration by both sounding bodies at the same time; its vibrations being alternately strong (when the vibrations of the two bodies coincide) and weak (when they oppose), as may be seen by a vibration microscope.

9. This illustrates how beats are produced in the ear. Thus, beats are produced when two sounding notes are near enough to each other in pitch so that the same elastic appendages of the auditory nerve will be set in sympathetic vibration by both notes at the same time; the combined effect focusing, as it were, at the point where both notes produce equal effect, which is nearly midway between (depending on the relative strength of the two notes). Naturally the combined effect diminishes as the distance from the focus increases, by increase of interval. This explains why beats decrease in strength with increase of interval.

10. When the number of beats is sufficient to produce a beat tone, a different elastic appendage, corresponding in vibration frequency to the number of beats, is brought into sympathetic vibration; thus, the beats and the beat tone,

being due to the sympathetic vibration of different parts, may be heard at the same time.

11. We noticed, on p. 181:4, that if a compound tone were sounded into a piano, those strings having a vibration frequency corresponding to the separate simple vibrations of which the compound sound-waves are composed will vibrate in sympathy. This roughly illustrates the principle by which the ear analyzes compound sound-waves; but, unlike the piano, the ear is capable of distinguishing the slightest differences of pitch, and its sympathetic sensitiveness is incomparably greater.

12. The principle is based on two laws: **first,** Fourier's law, the substance of which (in a musical sense) is, *that every compound vibration is the sum of a certain number of simple vibrations, and is therefore capable of being analyzed back into those simple vibrations;* **second,** Ohm's law, the substance of which is, *that the ear perceives only simple vibrations and hence does not recognize the compound sound-wave as a single whole, but only the simple elements of which it is composed.*

PART FOURTH

PRINCIPAL SOURCES OF MUSICAL SOUND

OUTLINE

As to Dimensions

- Linear
  - Strings
    - Transverse Vibrations
      - Laws of Vibration
        - Rapidity varies inversely as the length, inversely as the thickness, directly as the square root of the tension, and inversely as the square root of the weight.
      - How excited
        - Striking
        - Plucking
        - Bowing
          - Loudness, depending on amplitude of vibration.
          - Pitch, depending on rapidity of vibration.
          - Quality, depending on form of vibration.
      - Application—Piano, Guitar, Harp, Violin, etc.
    - Longitudinal Vibrations
      - Laws of Vibration—Same as in transverse vibrations.
      - How excited—By rubbing lengthwise with resined cloth.
      - Not used in music.
  - Rods
    - Transverse Vibrations
      - Both ends fixed
        - Similar to a stout string (rigidity answering to tension).
        - Not used in music.
      - One end fixed
        - Laws of Vibration
          - Rapidity varies directly as the thickness and inversely as the square of the length.
        - Application—Music-box, etc.
      - Both ends free
        - Supported in the middle
          - Application—Tuning-fork.
        - Supported at Nodal Points
          - Application—Harmonicon, etc.
    - Longitudinal Vibrations
      - Law of Vibration—Rapidity varies inversely as the length.
      - One end fixed
        - Series corresponding to the odd figures, 1, 3, 5, etc.
        - Sound-wave four times length of rod.
      - Both ends fixed / Both ends free
        - Sound-wave two times length of rod.
      - Not used in music.
  - Air Columns
    - Vibrations—Longitudinal.
    - Law of Vibration—Same as in longitudinal vibrations of rods.
    - Pipes
      - Stopped pipes—Analogous to rods fixed at one end.
      - Open pipes—Analogous to rods free at both ends.
    - Application—Pipe Organ, Wood Wind, and Brass Wind Instruments.
  - Reeds
    - Tongue-shaped—Application—Reed Organs, Clarinets, etc.
    - Membrane
      - Lips in playing Brass Instruments.
      - Vocal Cords in Singing.
- Surface
  - Membranes
    - Vibrations—Radial, Circular.
    - Class
      - With definite pitch—Application—Kettledrum.
      - Without definite pitch—Application—Drum, Tambourine, etc.
  - Plates
    - Vibrations—Radial, Circular.
    - Laws of Vibration
      - Other things being equal, rapidity varies directly as the thickness, and inversely as the area.
    - Application—Cymbals, Gongs.
  - Bells
    - How excited
      - By strokes—Application—Church Bells, Clock Chimes, etc.
      - By radial friction—Application—Musical Glasses.
    - Series—C (1) D (2) C (1) G♯ (3) D (4) etc.
      - 1
      - 2¼
      - 4
      - 6¼
      - 9

STRINGS, RODS, PIPES, REEDS

1. Only in strings, the narrower organ pipes, and the longitudinal vibrations of rods are the conditions wholly favorable for forming the natural harmonic series with vibrations proportional to the simple arithmetical series 1, 2, 3, 4, 5, 6, etc., already described.

2. Most other sounding bodies produce overtones which are more or less inharmonic with their prime tones.

3. **Transverse Vibrations of Rods.** In the case of rods fixed at both ends, we have conditions somewhat similar to a stout string (rigidity answering to tension).

4. In the case of rods fixed at one end, an entirely new set of conditions prevails, involving new laws of vibration, which are given in the outline. Ordinarily, only very high inharmonic overtones are produced when the rod is struck, which do not blend with the prime and soon die away; but if the rod is very strongly agitated, some of the lower harmonic overtones are faintly present. These last are present only when the amplitude of vibration is sufficient to produce a sensible flexure in the rod. In the music-box the teeth of the music-comb are relatively thin as compared with their length, and being made of very elastic material, they admit of considerable amplitude of vibration, and therefore tolerably good musical tones are produced. (The weights on the teeth also tend to develop harmonic overtones.)

5. In the case of a rod free at both ends and supported in the middle, each half is of the nature of a rod fixed at one end. A tuning-fork is a rod of this kind bent on itself in the middle and provided at this point with a stem or handle. Its principal use is as a standard of pitch, for which it is specially fitted, as when lightly struck and held close to the ear only the prime tone is audible. The high inharmonic overtones, however, produce a sensible tinkling when the fork is first

struck, but soon die away; and as they do not fuse with the prime the ear easily separates them.

6. In the case of a rod free at both ends and supported at the two nodal points, the section between the points of support will be of the nature of a rod fixed at both ends, and the end sections will be of the nature of rods fixed at one end.

7. **Longitudinal Vibrations of Rods.** If a rod fixed at one end and free at the other receive a blow against the free end lengthwise of the rod (or rubbed lengthwise with a resined cloth or the moistened finger), the impulse runs along the rod to the fixed end and is reflected back to the free end, but is now as a pulling force instead of a compressing force; and in this phase it runs along the rod to the fixed end and back to the free end, when it is again in its original phase, thus making a complete vibration, since from like phase to like phase is a complete vibration: hence, the time of vibration is the time required for the impulse to travel four times over the rod, and the wave-length is four times the length of the rod.

8. If the rod be fixed at both ends, the effect will be as if each half were fixed at one end and the middle of the rod were the free end of each half; thus, a rod fixed at both ends vibrates in the same time as a rod half the length fixed at one end; therefore, the time of vibration is the time required for the impulse to travel twice over the rod, and the wave-length is twice the length of the rod.

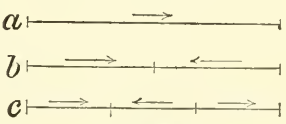


Fig. 45.

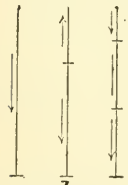


Fig. 46.

9. Fig. 45 shows how a rod fixed at both ends will break up into segments producing overtones: *a* shows the rod vibrating as a whole; *b*, in halves; *c*, in 3ds. In like manner the rod will divide into 4ths, 5ths, 6ths, etc.; the harmonic series being the same as in strings.

10. Fig. 46 shows how a rod fixed at one end will break up into segments: *a* shows the rod vibrating as a whole; *b* shows

it vibrating in two segments, the node forming at one-third the whole length from the free end, the upper segment vibrating as a rod fixed at one end and the lower segment as a rod twice as long fixed at both ends, both therefore vibrating in the same time (in all cases, the rod must divide so that each segment will vibrate in the same time); *c* shows the rod vibrating in three segments, the upper segment being half the length of the others—the upper node, therefore, will be one-fifth the whole length from the end, so that each segment may vibrate in the same time.

11. Since a rod fixed at one end vibrates as a rod twice the length fixed at both ends, therefore, if we regard *b* as the lower half, the whole rod would be divided into three segments; or, in the case of *c*, into five segments. So we see that the harmonics of a rod fixed at one end will be in the proportion of the odd numbers, 1, 3, 5, etc.; the overtones corresponding to the even numbers not being able to form.

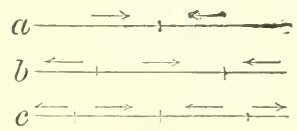


FIG. 47.

12. Fig. 47 shows how a rod free at both ends will break up into segments: *a* shows the fundamental vibration of the rod, which forms a node in the middle—each end vibrating as a rod fixed at one end; *b* shows the rod with two nodes, each one-fourth of the whole length from the end, the end segments vibrating as rods fixed at one end and the middle segment as a rod twice the length fixed at both ends, so that the time of each is the same; *c* shows the rod with three nodes, the outer segments being half the length of the others but vibrating as rods fixed at one end, while the inner segments vibrate as rods fixed at both ends, so that the time of each is the same.

13. The arrows in each figure represent one phase of the vibration; reversing the arrows would represent the opposite phase. In each figure we must conceive of the rod vibrating as *a*, *b*, *c*, etc., at the same time to form a conception of the

compound nature of the vibrations; as the rod not only vibrates as a whole, but also in segments forming overtones with the prime, similarly as already explained in strings, except that the vibrations are longitudinal instead of transverse.

14. **Pipes.** A pipe closed at one end (the mouth is always an open end) contains a rod of air fixed at one end, which therefore vibrates like a rod fixed at one end; and, like the rod, its harmonic series will be in the proportion of the odd numbers, 1, 3, 5, etc., the effect of which is to make the tone more dull and hollow.

15. A pipe open at both ends contains a rod of air free at both ends, which therefore vibrates like a rod free at both ends.

16. The prime note of the pipe closed at one end will be an octave lower than the same pipe open at both ends; as the open pipe, like the rod free at both ends, contains a node in the middle in sounding its prime note and therefore sounds the same note as a closed pipe half the length.

17. The pitch of pipes is mainly a question of length. The width, however, affects the quality of tone, the prominence of the overtones diminishing as the width increases; so that wide pipes produce hollow tones, while narrow pipes produce bright, penetrating tones.

18. In cylindrical pipes only every other overtone is prominent, producing a mellow tone. Flutes and clarinets are made on this principle.

19. Conical pipes tend to make the higher available overtones relatively more prominent, thus producing a more penetrating tone. Oboes and bassoons are made on this principle.

20. A peculiarity of the pipe, or tube, is that its prime tone can be made to jump from one harmonic to the next successively by gradually increasing the blowing force, so that any harmonic can be produced as the prime by blowing with the proper force. The narrower the pipe the more

prominent the overtones, and the more readily will the prime jump from one to another. This principle is employed more or less in the various wood-wind and brass-wind (especially brass-wind) instruments.

21. Brass instruments without keys are called natural instruments, and are capable of producing only the tones corresponding to their natural harmonics.

22. Keys on brass instruments are for the purpose of lengthening the tube, thus lowering the pitch of the instrument, thereby producing lower harmonic series. In three-keyed instruments, the first key lowers the pitch a tone; the second, a semitone; the third, a minor 3d; the first and second together, also a minor 3d; the second and third, a major 3d; the first and third, a perfect 4th; and all three together, an augmented 4th or diminished 5th; thus lowering the pitch from one to six semitones. By a proper selection from among the tones of the several harmonic series thus at command, the entire chromatic scale may be produced.

23. Other brass instruments (sliding trombones) have sliding sections which are drawn into six different positions, each successively lowering the pitch of the instrument a semitone.

24. Tone is produced on most of the brass instruments by the vibration of the player's lips as he blows into the cup-shaped mouth-piece; the *pitch* depending on the length of the tube, the force of blowing, and the rigidity or laxity of the lips; the *quality* depending on the width of the tube and the shape of the mouthpiece (the narrower the tube and the shallower the mouthpiece the brighter and more ringing the tone, and *vice versa*), and also on the size of the bell and shape of the lips.

25. In certain instruments of the flute order, the tone is produced by blowing at a certain angle and with a certain force against the edge of the mouth of the tube.

26. In the organ pipe and some other instruments, a

mouthpiece directs the current of air at the proper angle against the edge of the tube; and still other instruments have reeds in their mouthpieces to produce the necessary vibration. Clarinets have single-reed mouthpieces; oboes, bassoons, and English horns have double-reed mouthpieces. So we see that the column of air enclosed in a pipe is set in motion by various contrivances, but on two general principles: first, *direct*, by forcing the air against the edge of the pipe at a certain angle, thus producing a flutter of air at one end; second, *indirect*, by communicating the vibration of some other substance (as the lips or reeds) to the air of the tube.

27. **Resonance Boxes and Sounding-boards** are not strictly sources of musical sound, as they merely strengthen but do not originate sound. They are used mainly to strengthen the sound of vibrating strings, as in the violin, piano, etc. The resonance box (with the enclosed air) or sounding-board vibrating in unison with the strings strengthens the sound by reason of its greater vibrating volume. The vibrations of the strings are transmitted to the box or board, which in turn transmits them to the atmosphere. The direct vibrations of strings can be heard only a very short distance, so that the tones of the violin, piano, etc., are due mainly to the resonance box or sounding-board.

28. **Reeds.** A reed in musical instruments is a thin tongue of wood or metal fastened at one end to a slotted plate in such a manner that the tongue will vibrate either within or against the slot (the former called free, the latter beating reeds).

29. In free reeds the tongue exactly fits the slot, except that it is enough smaller to vibrate freely within the slot. In beating reeds, either the tongue or the slotted surface is slightly curved to permit the necessary play.

30. In either case, if a current of air be passed through the slot, the tongue will be pressed alternately into or against the slot by the pressure of the air and out by the reaction of

its own elasticity, so that the air will pass through in intermittent puffs. The end of the tongue is thinned down to a feather edge for high notes and sometimes weighted for low notes, so that the rapidity of vibration (and therefore pitch of tone) depends on the weight, length, and thickness of the tongue. The tone produced is due to the intermittent puffs of air, and not to the vibrations of the tongue, as might be supposed; the reed being merely a mechanical contrivance for rapidly opening and closing the passage-way of the air.

31. Owing to the varying size and shape of the opening, during each opening and closing, the pulses of air produced are compound in form, resulting in compound tones with prominent overtones. When reeds are used with tubes, the quality is much improved by the sympathetic resonance of the tube, which strengthens the tones corresponding to its own proper tones and damps the others.

32. The lips in blowing brass instruments and the vocal cords in singing are classed with reeds, as they are made to vibrate in a similar manner by a current of air.

MEMBRANES, PLATES, BELLS

1. These may be classed together under the head of surface vibrations. The preceding division involved only a lengthwise dimension, and the vibrations were confined to this one dimension; but surfaces admit of vibrations in all lateral directions, which evidently makes the analysis, as well as the series of overtones produced, more complex.

2. **Membranes and Plates** being similar in some respects may be considered together. Their vibrations may be divided into two general classes, radial and circular, which are usually more or less combined.

3. Fig. 48 may represent either a circular plate, or disk, or a stretched membrane as a drumhead. The circles within represent the nodal lines of the radial vibrations, and the diameters represent the nodal lines of the circular vibrations.

4. If a drumhead be struck exactly in the center, vibrations will radiate from the center similarly as when a pebble

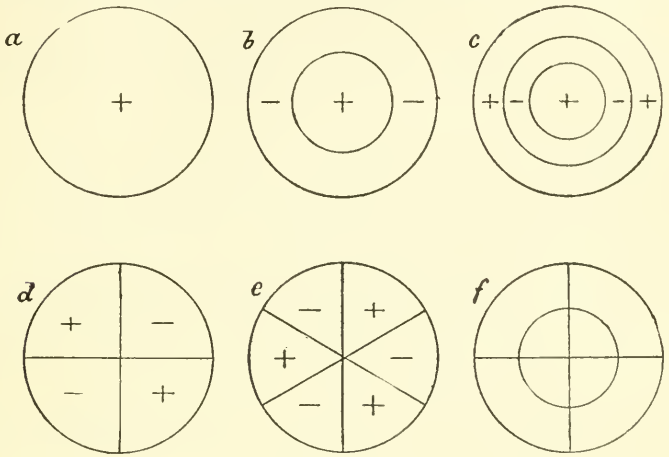


Fig. 48.

is dropped into the center of a circular pool of water; and when these radial vibrations break up into nodes they form nodal circles about the center (the signs + and — showing opposite phases of vibration): *a* represents the vibrations of the prime tone; and *b* and *c*, the vibrations of overtones. If the stroke is at one side of the center of the drumhead, other vibrations will also be produced, which tend to circle around the center and form nodal lines through the center, as at *d* and *e*. The vibrations circle both ways from the point of the stroke and meet at the opposite side, thus always dividing the membrane into an even number of segments by nodal diameters. Both systems of vibrations usually exist together, as at *f*.

5. The overtones produced by either system are mainly inharmonic with the prime tone; and when the two systems are combined, many inharmonic overtones of nearly the same pitch are produced.

6. If we suppose Fig. 48 to represent a circular plate, or

disk, then if this disk is supported at the rim, the conditions are somewhat similar to the drumhead (rigidity answering to tension); and if struck at the center, radial vibrations with nodal circles will be produced; but if the disk is supported at the center (or suspended from the rim) and struck at the rim, the conditions are reversed, and circular vibrations with nodal diameters will be produced.

7. Under all other conditions, between these theoretical extremes, both systems of vibrations will be combined; but, in general, the nearer the stroke is at the center the more the radial vibrations predominate, and the nearer the stroke is at the rim the more the circular vibrations predominate.

8. The overtones produced by *plates* differ from those of membranes, but are also mainly inharmonic with the prime, and involve also inharmonic overtones of nearly the same pitch (producing an empty tin-kettle quality) where the two systems of vibrations are combined. In both cases the series varies with varying conditions and cannot in any case be represented accurately. (The series produced by the circular vibrations of plates, as in the gong, is similar to that of bells, p. 195 : 15.)

9. Fig. 48 represents only a few of the more simple forms of vibration of the simplest and most symmetrical form of membranes or plates. Any more irregular form of membranes or plates would evidently give only more complex results. Long narrow plates would more properly be classed as rods.

10. Plates are not much used in music. Cymbals, however, are used in military bands to mark time.

11. Membranes as used in music are of two classes: those with definite pitch, as in the kettledrums; and those without definite pitch, as in the bass and tenor drums and the tambourine.

12. The kettledrum consists of a kettle-shaped shell of thin brass or copper, over the mouth of which is stretched

the membrane called the drumhead; the tone being reinforced by the associated air-chamber thus formed. Kettle-drums may be tuned within the compass of a perfect 5th by varying the tension of the membrane. They are generally used in pairs of unequal sizes, and are usually tuned to give the tonic and dominant. Sometimes three are used to give the tonic, dominant, and sub-dominant.

13. The bass drum, the tenor drum (called also side drum, snare drum, and military drum), and the tambourine are used chiefly to mark the rhythm of music without any regard to their pitch; they also excite the ear to a more acute appreciation of other sounds. The quality of tone and also the pitch, to a limited extent, may be altered by changing the tension of the drumhead. The pitch depends mainly on the size; thus, the bass drum, being larger, gives a lower pitch than the tenor drum.

14. **Bells.** A *Bell* is practically a bowl-shaped plate; the shape tending to eliminate the radial vibrations and emphasize the circular vibrations. In large bells the rim against which the clapper strikes is thickened (called the sound-bow).

15. In sounding its deepest tone a bell divides into four segments. It may also divide into any even number of segments. In bells of uniform thickness throughout, the vibration numbers of the series produced are proportional to the squares of the even numbers, 4, 6, 8, 10, 12, etc., into which the bell divides itself. The squares of these numbers would be 16, 36, 64, 100, 144, etc. Reducing by dividing through by 16, we get 1, $2\frac{1}{4}$, 4, $6\frac{1}{4}$, 9, etc., which would produce the following series:

$$\overset{1}{C_1},\ \overset{2\frac{1}{4}}{D_2},\ \overset{4}{C_3},\ \overset{6\frac{1}{4}}{G\sharp_3},\ \overset{9}{D_4},\ \text{etc.}$$

(The lower figures indicate the octave within which the tone is found.) From Fig. 33 (p. 157) we find that the vibration number 4 corresponds to C_3; and 9, to D_4; their ratio, $\frac{9}{4}$ or $2\frac{1}{4}$, to D_2. Sharping G_3 by multiplying its

vibration number (6) by $\frac{8}{5}\frac{5}{4}$ (the minor semitone), we get $6\frac{1}{4}$. None of these tones are harmonic to C except C_3.

16. Overtones are more prominent in thin than in thick bells; also in shallow than in deep bells. The deeper tones may be made mutually more harmonic by giving the bell a certain empirical shape. The tone also depends on the elasticity of the material and the thickness of the sound-bow. The body of the bell gives a deeper tone than the sound-bow, but not so loud.

17. The principal elements, then, which determine the tone of a bell, are weight, size, shape, thickness of the sound-bow, and elasticity of the material. If the bell is not cast perfectly homogeneous and symmetrical, irregularities naturally result.

18. Musical glasses may be classed with bells, as being similar in shape, though excited by friction instead of by strokes. When a bell is excited by a stroke the vibrations are necessarily transverse in character; but in musical glasses the vibrations are produced by passing the moistened fingers around the rim of the glass, and therefore, from the direction of the motion producing the vibrations, we see that they must be longitudinal (in the direction of the rim) in character. We would also judge, from the musical quality of the tone, that the series produced is harmonic.

PART FIFTH

APPENDIX

HISTORY OF THE DIATONIC SCALE

1. The earliest stages of music were naturally such as we still find among savage tribes, consisting of a few sounds differing in pitch but without any system as to their relations and the mode of using them. But in the growth of music from this rude state different systems have developed, many of which, besides our own, are still in use, especially in oriental countries.

2. Most of these systems recognize the octave, and some also the 4th and 5th. The Chinese, Japanese, and some other countries use chiefly a scale of five tones, called the Pentatonic Scale. The dividing points vary, however. The Hindoos divided the octave theoretically into twenty-two parts, but practically into seven degrees changeable into distinct modes in a manner somewhat similar to our own. The Persians divided the octave into twenty-four parts, each corresponding to half our semitone. The Arabs divided the octave into sixteen or seventeen parts (according to different authorities). Other systems might also be mentioned.

3. As to the ancient music of the Egyptians, nothing is clearly known regarding the scale except that the octave was largely subdivided. The music of the Chaldeans, Babylonians, Assyrians, Phœnicians, and Hebrews is supposed to have been of a similar character.

4. Our own musical system can be traced back directly to the Greeks, and still farther back through the early migrations into Greece, to the Persians and Hindoos.

5. In the ancient four-stringed Greek lyre, the outside strings were tuned to the interval of a 4th, and the middle strings were more or less varied. The lyre thus gave a series of four notes, which was called a tetrachord, and which has ever since remained a prominent element of the music scale.

6. About 670 B.C. Terpander increased the number of strings to seven, making two tetrachords with the middle string common to both. The tuning depended entirely upon the ear; there was yet no means for accurately measuring or recording the pitch of tones.

7. This seems to be the history in brief of the development of the scale up to the time of Pythagoras, about 550 B.C., who is regarded as the father of musical science.

8. Pythagoras discovered the relations between the length of strings and the pitch of tones, and that intervals could be given definite numerical values. He found that the simplest division of the string (into two equal parts) gave a tone which his ear told him was the most closely related to the fundamental, thus fixing the interval of the octave. He next found that two-thirds of the string gave a tone which formed a natural subdivision of the octave, and also that three-fourths of the string gave another natural subdivision of the octave. He no doubt observed the relationship of these two intervals (now called perfect 5th and perfect 4th) to each other; that either reckoned upward and the other downward gave the interval of an octave, and that the octave therefore was equal to their sum. Thus these three intervals were established as the most important intervals in music.

9. The tones of the scale thus fixed (taking the octave on C) are C ———— F G ———— C, leaving a perfect 4th between C and F and between G and C to be filled up. Since the 5th and 4th are natural intervals, their difference

(now called a tone) is also a natural interval, as it occurs naturally between F and G. This is taken as the most convenient interval to subdivide the perfect 4ths.* This led to an unequal division, as the perfect 4th contained two tones, and a semitone (nearly) over, and admitted of three arrangements, namely, the semitone may be below, in the middle, or above, all of which were used. Thus the octave was made up of two tetrachords with a separating tone in the middle.

10. Having established the scale of the octave, it was easy to extend the scale by adding octaves of the notes already fixed. In this way the scale was extended to two octaves.

11. The scale thus established has remained practically unchanged for more than 2000 years to the present time. However, a slight correction was found necessary. The difference between the perfect 4th and perfect 5th was a major tone (ratio $\frac{9}{8}$); using this as a measure, the Pythagorean scale would be as follows:

1	$\frac{9}{8}$	$\frac{81}{64}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{27}{16}$	$\frac{243}{128}$	2
C	D	E	F	G	A	B	C

$$1 \times \tfrac{9}{8} \times \tfrac{9}{8} \times \tfrac{256}{243} \times \tfrac{9}{8} \times \tfrac{9}{8} \times \tfrac{9}{8} \times \tfrac{256}{243} = 2$$

The two major tones together form the interval of a Pythagorean major 3d having a ratio $\frac{9}{8} \times \frac{9}{8} = \frac{81}{64}$, which is inharmonious; but we find very near it the simple harmonious ratio $\frac{80}{64} = \frac{5}{4}$, which is called the true major 3d. The difference between the true major 3d $(\frac{5}{4})$ and the major tone $(\frac{9}{8})$ is $\frac{5}{4} \div \frac{9}{8} = \frac{10}{9}$, which is called the minor tone. The difference between the Pythagorean and the true major 3d $(\frac{81}{64} \div \frac{80}{64})$ is $\frac{81}{80}$. This added to the semitone gives $\frac{256}{243} \times \frac{81}{80} = \frac{16}{15}$. The corrected scale then is as follows:

1	$\frac{9}{8}$	$\frac{5}{4}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{5}{3}$	$\frac{15}{8}$	2
C	D	E	F	G	A	B	C

$$1 \times \tfrac{9}{8} \times \tfrac{10}{9} \times \tfrac{16}{15} \times \tfrac{9}{8} \times \tfrac{10}{9} \times \tfrac{9}{8} \times \tfrac{16}{15} = 2$$

*Another mode of construction is by perfect 5ths and octaves. Thus, beginning at C and taking 5ths upward, the first will give G, the next D; dropping down an octave, the next will give A, the next E; dropping down an octave, the next will give B; then, taking a 5th downward from C, we get F. This is practically the same as alternately taking 5ths up and 4ths down, since a 5th up and an octave down is the same as a 4th down.

which we see by the simpler ratios is more harmonious.

12. The major 3d in the lower tetrachord could be corrected, either by shortening the interval between C and D or between D and E; but D is an important note, as it forms a perfect 5th to the G below, G being second in importance to the tonic C; the correction is therefore made by shortening the interval between D and E. In the upper tetrachord the correction is made by shortening the interval between G and A, thus correcting the major 3d between F and A as well as the major 3d between G and B. This puts the I, IV, and V triads in perfect tune; but if A were major, the IV triad (F A C) would be out of tune.

13. Observe also that the minor 3d between D and F (ratio $\frac{10}{9} \times \frac{16}{15} = \frac{32}{27}$) is not a true minor 3d, while all the other minor 3ds are true minor 3ds (ratio $\frac{9}{8} \times \frac{16}{15} = \frac{6}{5}$); also that the ratio of the 5th between D and A is $\frac{10}{9} \times \frac{16}{15} \times \frac{9}{8} \times \frac{10}{9} = \frac{40}{27}$, while the ratio of the perfect 5th is $\frac{3}{2}$; therefore the II triad (D. F. A.) is still not in perfect tune—its minor 3d and its 5th being too flat by the difference between the major and minor tones ($\frac{9}{8} \div \frac{10}{9} = \frac{81}{80}$), called a Comma, or a little more than one-fifth of a semitone (log. of $\frac{81}{80}$ is .00539; log. of semitone is .02509 : $\frac{5}{25}\frac{3}{10}\frac{9}{9} = \frac{1}{5}$ nearly). This is a necessary evil, since it can be remedied only by shortening the interval between C and D, instead of between D and E, which would put the V triad out of tune.

14. The correction of the Pythagorean major 3d to a true major 3d was first suggested by Didymus about the beginning of the Christian era, but was not fully adopted till toward the close of the middle ages.

15. These distinctions do not apply to the *equal temperament* scale, all of the intervals of which, except the octave, are more or less out of tune; temperament being merely an attempt to conform the scale to a practical simplicity in keyed instruments. The tempered scale has come gradually into

use with the growth in popularity and prominence of keyed instruments.

16. The Greeks named the fifteen tones in the two octaves by different Greek words. The Romans adopted the Greek scale but named the fifteen tones by the first fifteen Roman letters from A to P. Gregory, about 600 A.D., adopted the system of repeating the same letters in each octave, but used capitals in the first octave, small letters in the second octave, and double small letters in the third octave; which distinctions were finally dropped.

17. Guido of Arezzo, about the beginning of the eleventh century, discarded the tetrachord method of grouping the tones and arranged the twenty notes then in use into groups of six, called hexachords; and to facilitate the singing named the six notes *Ut*, *Re*, *Mi*, *Fa*, *Sol*, *La*, which were suggested by a verse of a hymn to St. John, in which they occurred in order as the first syllable of each successive line, each line beginning a note higher. *Ti* has been added to fill out the octave; and *Ut*, being a bad syllable to sing, has been changed to *Do*. Guido also introduced the system of notating the scale on lines and spaces.

18. Franco of Cologne, about the middle of the twelfth century, is credited with introducing the system of representing the relative time value of notes by their shape. The system of dividing the music into measures by drawing bars across the staff can be traced to about the year 1574.

19. The characters ♯, ♭, and ♮ originated during the eleventh and twelfth centuries. The ♭ and the ♮ came from different forms of the letter B and were used originally to show the position of that letter only—♭ showing the lower, and ♮ the higher position. The ♯ originally was a St. Andrew's cross.

ANCIENT GREEK MODES

1. Mode refers to the octave form, or mode of arrangement, of the steps and half-steps in the octave. On page 198 : 9, the octave was shown as made up of two tetrachords with an added (separating) tone between; the added tone was sometimes placed below or above, instead of between.

2. The tetrachord may be arranged in three principal ways, as follows (letting — represent the step and ⌣ the half-step): — — ⌣ (Lydian tetrachord); — ⌣ — (Phrygian tetrachord); ⌣ — — (Dorian tetrachord). The names refer to three people or provinces of Greece, from whom they are supposed to have originated.

3. The modes or octave forms were termed Lydian, Phrygian, or Dorian, according to the kind of tetrachords involved. If the added tone was below, the term Hypo was prefixed; if the added tone was above, the term Hyper was prefixed. There was, however, some variation in the names, as shown below.

4. **The Earlier Greek Modes.** These were seven in number, as follows:

1. Lydian — C–D–E⌣F– G–A–B⌣C

2. Phrygian — D–E⌣F– G–A–B⌣C–D

3. Dorian — E⌣F– G–A–B⌣C–D–E

4. Hypo-Lydian (Syntono-Lydian) — F–G–A–B⌣C–D–E⌣F

5. Hypo-Phrygian (Ionian or Iastian) — G–A–B⌣C–D–E⌣F–G

6. Hypo-Dorian (Æolian or Locrian) — A–B⌣C–D–E⌣F–G–A

7. (Hyper-Dorian / Mixo-Lydian) — B⌣C–D–E⌣F–G–A–B / B⌣C–D–E⌣F–G–A–B⌣(C)

(See also p. 54, Fig. 13.)

5. We see that all these modes, if starting on the proper letter as shown above, exactly fit into the scale without in-

volving accidentals (corresponding to our keys on the same letters, with the signatures omitted). In this sense, each mode represents a certain section of the scale, as indicated in Fig. 49. It should not be inferred, however, that they were used only in this sense. They may each be taken at any pitch, which would thus involve accidentals to express them in our notation (remembering that ♯'s, ♭'s, and also the staff and roman letters were not used by the Greeks). In either sense, the modes represent different octave forms.

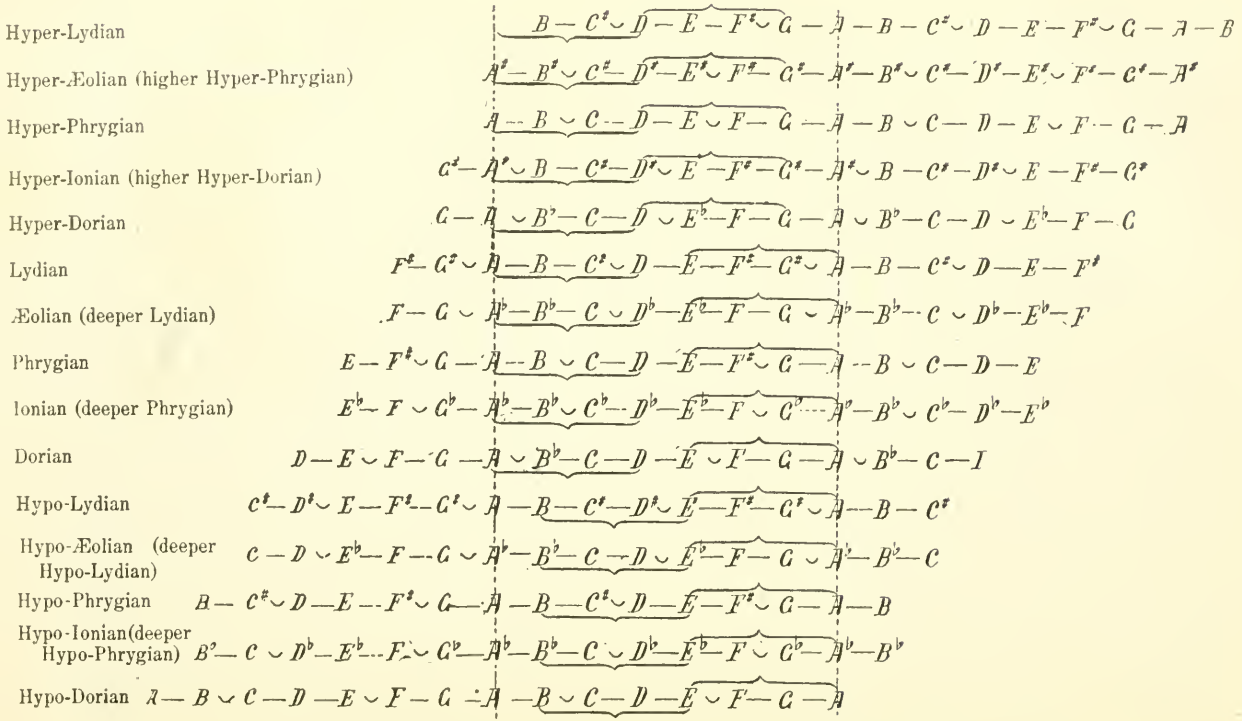
FIG. 49.

6. The Greek music (as all ancient music) was monophonic. The melodies were at first confined to the compass of the tetrachord; later, two tetrachords were combined and the scale thus extended to the octave; and still later, the scale was extended to two octaves. In the meantime, the Hypo-Dorian (corresponding to our old minor mode, see p. 53: 1, 2) became the mode in most common use, and thus acquired prominence over the others in a manner analogous to our major mode.

7. **The Later Greek Modes.** About the fourth century B.C., at the time of Aristoxenus, the scale had been extended to two octaves, and there were thirteen modes in use, which were afterward increased to fifteen, as shown on p. 204.

8. These might also be represented on the staff, similarly as in Fig. 49, by placing before each a signature corresponding to the number of sharps or flats in each.

9. It will be seen that the modes are named according to the character of the octave between the dotted lines in which all the modes stand parallel. It will be seen also that as between the extremes of each they are all the same, differing only in pitch, and are merely transpositions of the Hypo-Dorian. In this sense, therefore, they are merely transposing



(Some authorities begin on *F* instead of *A*, thus centering the whole scheme on middle C.)

scales (corresponding to our fifteen old-minor keys). However, they may have been used largely in a parallel sense as distinct octave forms.

10. There has been much dispute as to their real character, some holding the theory of transposing scales, and others the theory of distinct octave forms.

11. **The Early Church Modes.** In the fourth century A.D., Bishop Ambrose of Milan, in view of the existing confusion, established four scales for church use, corresponding to the original Greek Phrygian, Dorian, Hypo-Lydian, and Hypo-Phrygian, and established also their character as distinct modes, or octave forms, by fixing the lowest note of each as the tonic. A little later Pope Gregory added to these four others derived from them by ranging the scale from a 4th below the tonic to a 5th above. These were called *Plagal*, while the Ambrosian ones were called *Authentic*.

12. In time, much confusion again existed, and in 1547 Glareanus proposed six authentic and six plagal modes, making twelve in all, which he called the *Dodecachordon*. Of these, the ten which remained are given in the following outline:

		Church name	Name given by Glareanus	Original Greek name
Church Modes	1st mode	(Authentic)	Dorian	Phrygian
	2d "	(Plagal of 1st)	Hypo-Dorian	
	3d "	(Authentic)	Phrygian	Dorian
	4th "	(Plagal of 3d)	Hypo-Phrygian	
	5th "	(Authentic)	Lydian	Hypo-Lydian
	6th "	(Plagal of 5th)	Hypo-Lydian	
	7th "	(Authentic)	Mixo-Lydian	Hypo-Phrygian
	8th "	(Plagal of 7th)	Hypo-Mixo-Lydian	
Secular Modes	Our Major Mode		Ionian	Lydian
	Our (old) Minor Mode		Æolian	Hypo-Dorian

Observe that by some confusion Glareanus misapplied the original Greek names.

13. The eight modes as established by Ambrose and Gregory are known as the Early Church modes. The other two,

corresponding to our major and minor modes, were used only in secular music; but these last are the only ones that have survived through the development of *polyphonic* music, since they are capable of more harmonic combinations than the others.

TABLE OF COMMON MUSICAL INTERVALS

Intervals			Ratio	Semitone value	Intervals			Ratio	Semitone value
Unison	Perfect		$\frac{1}{1}$		6th	Minor		$\frac{8}{5}$ *	8.14
	Aug.	minor semitone	$\frac{25}{24}$ *	.70		Major		$\frac{5}{3}$ *	8.84
2d	Minor	major semitone	$\frac{16}{15}$ *	1.12		Aug.		$\frac{225}{128}$	9.76
	Major	minor tone	$\frac{10}{9}$ *	1.82	7th	Dim.		$\frac{128}{75}$	9.26
		major tone	$\frac{9}{8}$ *	2.04		Minor		$\frac{16}{9}$	9.96
	Aug.		$\frac{75}{64}$	2.74		Major		$\frac{15}{8}$*	10.88
3d	Dim.		$\frac{256}{225}$	2.24	Octave	Dim.		$\frac{48}{25}$	11.29
	Minor		$\frac{6}{5}$ *	3.16		Perfect		$\frac{2}{1}$ *	12.00
	Major		$\frac{5}{4}$ *	3.86	Comma			$\frac{81}{80}$	.22
4th	Dim.		$\frac{32}{25}$	4.28	Pythagorean Comma			$\frac{531441}{524288}$	.24
	Perfect		$\frac{4}{3}$ *	4.98					
	Aug.		$\frac{45}{32}$	5.90	Enharmonic Diesis			$\frac{128}{125}$	.42
5th	Dim.		$\frac{64}{45}$	6.10					
	Perfect		$\frac{3}{2}$ *	7.02	Schisma			$\frac{32805}{32768}$	.02
	Aug.		$\frac{25}{16}$	7.72					

1. The derivations of the ratios marked with a * are given on pp. 157:2; 159:11; 160:15. From these the others are easily found.

2. If we subtract ($\div$) the major semitone E to F from the major 3d E to G♯, we get the *aug.* 2d F to G♯ ($\frac{5}{4} \div \frac{16}{15} = \frac{75}{64}$). The *dim.* 7th is the inversion of this ($\frac{2}{1} \div \frac{75}{64} = \frac{128}{75}$).

3. If we add ($\times$) two major semitones we get the dim. 3d ($\frac{16}{15} \times \frac{16}{15} = \frac{256}{225}$). The aug. 6th is the inversion of this ($\frac{2}{1} \div \frac{256}{225} = \frac{225}{128}$).

4. If we add two major 3ds we get the aug. 5th ($\frac{5}{4} \times \frac{5}{4} = \frac{25}{16}$). The dim. 4th is the inversion of this ($\frac{2}{1} \div \frac{25}{16} = \frac{32}{25}$).

5. The aug. 4th (tritone) from F to B equals the major tone F to G plus the major 3d G to B ($\frac{9}{8} \times \frac{5}{4} = \frac{45}{32}$). The dim. 5th is the inversion of this ($\frac{2}{1} \div \frac{45}{32} = \frac{64}{45}$).

6. The minor 7th is the inversion of the major 2d ($\frac{2}{1} \div \frac{9}{8} = \frac{16}{9}$). The major 7th is the inversion of the minor 2d ($\frac{2}{1} \div \frac{16}{15} = \frac{15}{8}$).

7. The dim. octave is the inversion of the aug. unison ($\frac{2}{1} \div \frac{25}{24} = \frac{48}{25}$).

8. The *Comma* is the difference between the major and minor tones ($\frac{9}{8} \div \frac{10}{9} = \frac{81}{80}$). This comma is always meant unless otherwise designated.

9. The *Pythagorean Comma* is found by taking twelve 5ths up and seven octaves down, thus:
$\frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{312}{210} = \frac{531441}{524288}$. It is also equal to the sum of the comma and schisma (.22 + .02 = .24).

10. The *Enharmonic Diesis* is the difference between the major and minor semitones ($\frac{16}{15} \div \frac{25}{24} = \frac{128}{125}$).

11. The *Schisma* is found by taking eight 5ths and a major 3d up and five octaves down, thus:
$\frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} \times \frac{5}{4} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{32805}{32768}$. It is also equal to $\frac{1}{12}$ of a Pythagorean Comma (.24 ÷ 12 = .02).

TEMPERAMENT

1. *Temperament* is an attempt to conform the scale of nature to the keyboard. From the earliest invention of the keyboard it has contained, in general practice, twelve keys or notes to the octave. A few attempts have been made to make the keyboard more nearly conform to the scale of nature by increasing the number of keys; but such instruments were too complicated and never came into general use, so that twelve remains as the most practical number. Hence

the object of the twelve-note systems of temperament is to limit the scale to twelve notes to the octave, so tuned as to give the best practical results.

2. There are only two systems of temperament that have been used to any extent: the *Equal Temperament*, which is the one now in most general use; and the *Mean-Tone Temperament*, which was the one formerly in most general use, and is still at least of historical interest.

3. **Equal Temperament,** however, is the older. It was very early observed that twelve 5ths minus seven octaves equaled the Pythagorean comma (about $\frac{1}{4}$ of a semitone), and Aristoxenus (fourth century B.C.) is said to have advocated the idea of distributing this difference among the twelve 5ths (the 5ths thus tempered are called equal 5ths). This is the basis of *equal temperament;* for, taking twelve equal 5ths up, thus, C, G, D, A, E, B, F♯, C♯, G♯, D♯, A♯, E♯ or F, B♯ or C, or twelve equal 5ths down, thus, C, F, B♭, E♭, A♭, D♭, G♭, C♭ or B, F♭ or E, A, D, G, C, we get the entire chromatic scale. In either case, twelve 5ths takes us once around the key-circle (which is 7 octaves) to the starting-point; but if the 5ths were true, we would have landed a Pythagorean comma past the starting-point. If we had dropped down an octave whenever we exceeded that interval, or had alternately taken 5ths up and 4ths down (two successive 4ths down from B to C♯), we would have gotten the chromatic scale direct.

4. The great advantage of equal temperament is that all the keys are equally in tune and may all be used. The principal objection is the sharp major 3ds which result from this temperament; to remedy which, the Mean-Tone Temperament was invented.

5. **Mean-Tone Temperament** can be traced back to Zarlino and Salinas, two Italian authors of the sixteenth century, and in 1700 was in general use and continued in general use till about 1840, when the practice in tuning keyboard instruments began to return to Equal Temperament.

6. Mean-Tone Temperament is based on the principle that four 5ths up and two octaves and a major 3d down ($\frac{3}{2}\times\frac{3}{2}\times\frac{3}{2}\times\frac{3}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{4}{5}=\frac{81}{80}$) give the comma; and hence, if in tuning by 5ths up and octaves down we use 5ths diminished by $\frac{1}{4}$ of a comma (called mean-tone 5ths), we would get true major 3ds. The difference between the major tone ($\frac{9}{8}$) and the minor tone ($\frac{10}{9}$) also equals the comma ($\frac{9}{8}\div\frac{10}{9}=\frac{81}{80}$); hence, if we flat the major tone or sharp the minor tone by $\frac{1}{2}$ of a comma, we would get the mean-tone, or tone midway between. Now if we begin at C and tune by mean-tone 5ths, the first 5th up will give G, which will be $\frac{1}{4}$ of a comma flat; taking a 5th downward from C above will give F, which will be $\frac{1}{4}$ of a comma sharp: therefore the interval between F and G is contracted $\frac{1}{2}$ of a comma and becomes a mean-tone. Now a 5th up and an octave down is the same as a 4th (inverted 5th) down, and tuning an octave down after every two 5ths up is the same as alternately taking 5ths up and 4ths down; and therefore every whole tone thus fixed is necessarily equal to the difference between the 4th and 5th, since no other intervals are used. Therefore tuning by mean-tone 5ths necessarily makes all the tones mean-tones; from which fact the temperament takes its name.

7. The comma ($\frac{81}{80}$) is about $\frac{1}{5}$ of a semitone, and $\frac{1}{4}$ of a comma would be about $\frac{1}{20}$ of a semitone, and therefore the mean-tone 5th is about $\frac{1}{20}$ of a semitone flat; while the equal 5th of the equal temperament is about $\frac{1}{21}$ of a semitone flat. However, the error is still quite imperceptible in the chord.

8. The minor 3d is also $\frac{1}{20}$ of a semitone flat (being the difference between the true major 3d and the mean-tone 5th), while in the equal temperament it was $\frac{1}{6}$ of a semitone flat, and is therefore much improved.

9. In the following table we have mean-tone temperament, true intonation, and equal temperament compared. The second and third columns correspond to the table on p. 166.

10. To find the values in the first column, first find the value of the comma, thus: $3.86 - 2.04 = 1.82$, equals minor tone between D and E; $2.04 - 1.82 = .22$, equals difference between major and minor tones, equals comma; $.22 \div 4 = .05 = \frac{1}{4}$ of comma, equals amount of temperament of the mean-tone 5th.

	Mean-Tone Temperament	True Intonation	Equal Temperament
	Semitones	Semitones	Semitones
C	12.00	12.00	12.00
B	10.83	10.88	11.00
A	8.89	8.84	9.00
G	6.97	7.02	7.00
F	5.03	4.98	5.00
E	3.86	3.86	4.00
D	1.93	2.04	2.00
C	0.	0.	0.

11. $7.02 - .05 = 6.97 = G$; $12.00 - 6.97 = 5.03 = F$; we may take E directly from the middle column, as it is a true major 3d; $3.86 \div 2 = 1.93 = D$, or mean-tone; $5.03 + 3.86 = 8.89 = A$; $6.97 + 3.86 = 10.83 = B$. Or by taking 5ths up and 4ths down, thus, $G - F = D$, $D + G = A$, $A - F = E$, $E + G = B$; or by taking 5ths up and octaves down (whenever the octave is exceeded); or we might use still other combinations.

12. In the preceding table we have the natural scale of C, corresponding to the white notes of the keyboard. As there are only five black notes in each octave of the keyboard we can extend the temperament to only five other keys, since in mean-tone temperament the sharps and flats do not coincide as in equal temperament. We might take the first five sharp keys or the first five flat keys; but the first three sharp keys (G, D, and A) and the first two flat keys (F and B♭) are the most used.

13. The first three sharps are F♯, C♯, and G♯; the first two flats are B♭ and E♭. To tune these we must make F♯ a true major 3d to D ($1.93 + 3.86 = 5.79$); C♯, a true major 3d to A ($8.89 + 3.86 - 12.00 = .75$); G♯, a true major 3d to E ($3.86 + 3.86 = 7.72$); B♭, a true major 3d below D ($12.00 + 1.93 - 3.86 = 10.07$); E♭, a true major 3d below G (6.97

$-3.86 = 3.11$). These, with the white notes, would give us all the notes of the six keys C, G, D, A, F, and B♭, all equally in tune. The other keys are more or less out of tune, according to the number of notes missing. In the key of E, D♯ is missing and we would have to use E♭ in its place, which differs by the enharmonic diesis (see table, p. 206); this is what is called a wolf (comparing the effect to the howling of a wolf). Similarly in the key of E♭, we would have to use G♯ for A♭. The other keys contain more wolves.

14. In some old organs the black keys between D and E and between G and A were divided and tuned to give both the sharp and flat notes, thus bringing the keys of E and E♭ into tune.

15. The merit of the Mean-Tone Temperament is the greater harmoniousness of the most useful keys, and its demerit is in its limitation to those keys. On the other hand, equal temperament has the freedom of all the keys; for which reason, the balances finally turned in favor of equal temperament.

TUNING

1. Tuning in any temperament is done as far as possible by 5ths, 4ths, and octaves, till all the notes in the tuning octave (usually near the middle of the keyboard) are tuned. These are called the bearings, from which the other notes above and below are tuned by octaves.

2. Only the 5ths and 4ths are required to beat, as the octave is always a true interval and should not beat. The 5ths and 4ths are first tuned true, then the 5ths contracted and the 4ths expanded till the required number of beats are heard.

3. The usual method of tuning the bearings consists in alternately taking 5ths up and 4ths down. If we take the octave above middle C as the tuning octave, the notes would be tuned in the following order (C being first tuned by a standard tuning-fork or other standard).

EQUAL TEMPERAMENT

	1.2	1.3	1.4	1.5	1.6	1.7	.9	.9	1.0	1.1	1.1	1.2
C	C♯	D	D♯	E	F	F♯	G	G♯	A	A♯	B	C
	7	2	9	4	11	6	1	8	3	10	5	12

FIG. 50.

4. The figures below the letters show the order in which the notes are tuned: first, taking a 5th up to G; second, a 4th down to D; third, a 5th up to A; etc. The figures above the letters are the number of beats per second in each 5th up or 4th down (the number varying with pitch). First, calculate the number of beats in the 5th and 4th at a certain pitch, then, to find the number at any other pitch, multiply or divide by the ratio of the interval at which the 5th or 4th is taken above or below the pitch at which the beats are already found.

5. Let B = number of beats; N = number of vibrations in the lower note; M = number of vibrations in the upper note; $\frac{m}{n}$ = the ratio of the true interval in its lowest terms: then the algebraical formulas for finding the number of beats would be (1) $B = Nm - Mn$ if the interval is flat (less than the true interval), or, (2) $B = Mn - Nm$ if the interval is sharp (greater than the true interval).

6. It was shown on p. 167 : 2 that the blending harmonics were in exact accord with the ratio of the interval; thus, in the 5ths (ratio $\frac{3}{2}$) every second harmonic of the upper note and every third harmonic of the lower note blend, therefore multiplying the lower note by the upper figure of the ratio or the upper note by the lower figure would give the lowest blending harmonics, and similarly for any interval; so that the number of vibrations in the lowest blending harmonics of two notes may be found by multiplying the vibrations of the lower note by the upper figure of the ratio or the vibrations of the upper note by the lower figure of the ratio. If the interval is true, these products will be equal ($Nm = Mn$) and

the lowest blending overtones will be in unison; but if the interval is not true, the products will differ, and the lowest blending overtones will beat by not being in perfect unison.

7. It was shown also (p. 171 : 10) that the difference between the lowest blending overtones determined the number of imperfect consonance beats; therefore, $Nm - Mn$ or $Mn - Nm$ (according as the interval is flat or sharp) equals number of beats.

8. The amount of temperament of the equal 5ths is $\frac{1}{12}$ of the Pythagorean comma (see p. 208: 3); this is called the Schisma, the ratio of which is $\frac{32805}{32768}$ (see table, p. 206).

9. If middle C = 256 vibrations, G = $256 \times \frac{3}{2} = 384$. Flat G by the schisma, thus, $384 \div \frac{32805}{32768} = 383.56+$. Therefore $N = 256$, $M = 383.56$, $m = 3$, $n = 2$. Substituting these values in formula (1), we get $B = .88$. If middle C = 270 vibrations (the highest standard), we would get, by figuring from this standard, $B = .92$. Therefore .9 (which is the mean) may be taken as the number of beats in the 5th above middle C for all standards of pitch.

10. If middle C = 256, F = $256 \times \frac{4}{3} = 341.33$. Sharp F by the schisma, thus, $341.33 \times \frac{32805}{32768} = 341.72$. Therefore $N = 256$, $M = 341.72$, $m = 4$, $n = 3$; and from formula (1) we would get $B = 1.16$; or if middle C = 270, we would get $B = 1.23$. Therefore, 1.2 may be taken as the number of beats in the 4th above middle C for all standards of pitch.

11. From these values we may obtain the number of beats at any pitch; thus, the 4th from G down to D is a major 2d higher than the 4th from C to F ($1.2 \times \frac{9}{8} = 1.3$), which gives 1.3 for D. The 5th from D up to A is a major 2d higher than the 5th from C to G ($.9 \times \frac{9}{8} = 1.0$), which gives 1.0 for A, etc.

MEAN-TONE TEMPERAMENT

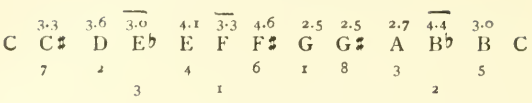


Fig. 51.

12. In Mean-Tone Temperament, tune the notes in the same order as before up to G♯, then begin again at C and tune a 4th up to F, then another 4th up to B♭, then a 5th down to E♭.

13. In the table on p. 206, the value of the comma is .22 *s*. ¼ of .22 *s* = .055 *s*, which is the amount of temperament of the mean-tone 5th. Also the value of the schisma is .02, which is the amount of temperament of the equal 5th (.055 ÷ .02 = 2¾), from which we find that *mean-tone* is 2¾ times *equal* temperament. Therefore the simplest method of finding the beats over the letters in Fig. 51 is by multiplying the number over the corresponding letters in Fig. 50 by 2¾, except F, B♭, and E♭, in tuning which we again started at C; but we found the number of beats for C to F in equal temperament was 1.2, therefore 1.2 × 2¾ = 3.3 = number for F in mean-tone; F to B♭ is a 4th higher, therefore 3.3 × ⅓ = 4.4 = number for B♭; B♭ to E♭ is a minor 3d higher than the 5th from C to G, therefore 2.5 × ⅚ = 3.0 = number for E♭.

14. In a similar manner, we might calculate the beats for any other tuning octave in either temperament.

15. It is necessary to count the number of beats in 10 seconds to remove the decimals; 3.3 beats in one second equals 33 beats in 10 seconds.

CALCULATION OF PITCH NUMBERS

1. From formula (1) $B = Nm - Mn$ we get formulas (3) $N = \frac{Mn + B}{m}$ and (4) $M = \frac{Nm - B}{n}$. From formula (2) $B = Mn - Nm$ we get formulas (5) $N = \frac{Mn - B}{m}$ and (6) $M = \frac{Nm + B}{n}$.

2. Formula (3) is used for 5ths down; (4) for 5ths up; (5) for 4ths down; and (6) for 4ths up.

3. In taking 5ths down or 4ths up B is + because the tuning note is raised to contract the 5th or expand the 4th, while in taking 5ths up or 4ths down B is — because the tuning note is lowered for the same reason.

4. In the table on p. 216 the number of vibrations is calculated for each note of the octave above middle C for either temperament. The number of the formula which applies stands opposite each section, and the value of each letter of the formula is indicated.

5. The figures over the letters of the equal tempered scale are practically accurate for all standards of pitch; but owing to the greater amount of temperament of the mean-tone 5th, it is necessary to divide the range between the extreme standards of pitch into three sections, using the figures over the letters of the mean-tone scale for the middle section, and adding .1 to each for the higher section, and subtracting .1 from each for the lower section.

6. In Mean-Tone Temperament, middle C ranges in the different standards from 252.7 (Handel's pitch) to 283.6 (Durham's pitch). The pitch (264) given in table is called Helmholtz's pitch, and is nearly midway between.

7. By means of beats we may also find the number of vibrations in any note, without the known vibrations of some other note from which to figure.

8. From formula (1) we get $B = \left(m - n\frac{M}{N}\right)N$, or $N = \frac{B}{m - n\frac{M}{N}}$. From formula (2) we would get $N = \frac{-B}{m - n\frac{M}{N}}$; so that B is + or — according as the interval is flat or sharp.

9. Now $\frac{M}{N}$ = the actual ratio of the interval (being the vibrations of the upper note divided by the vibrations of the lower), and $\frac{m}{n}$ = the ratio of the true interval. Let it be re-

Equal Temperament

	1.2	1.3	1.4	1.5	1.6	1.7	.9	.9	1.0	1.1	1.1	1.2
C	C♯	D	D♯	E	F	F♯	G	G♯	A	A♯	B	C
7		2	9	4	11	6	1	8	3	10	5	12

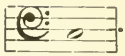
	N =	256.0	= C
	m =	3	
4		768.0	
	B =	9	
	n =	2)767.1	
	M =	383.6	= G
	n =	3	
5		1150.8	
	B =	1.3	
	m =	4)1149.5	
	N =	287.4	= D
	m =	3	
4		862.2	
	B =	1.0	
	n =	2)861.2	
	M =	430.6	= A
	n =	3	
5		1291.8	
	B =	1.5	
	m =	4)1290.3	
	N =	322.6	= E
	m =	3	
4		967.8	
	B =	1.1	
	n =	2)966.7	
	M =	483.3	= B
	n =	3	
5		1449.9	
	B =	1.7	
	m =	4)1448.2	
	M =	362.0	= F♯
	n =	3	
5		1086.0	
	B =	1.2	
	m =	4)1084.8	
	N =	271.2	= C♯
	m =	3	
4		813.6	
	B =	.9	
	n =	2)812.7	
	M =	406.4	= G♯
	n =	3	
5		1219.2	
	B =	1.4	
	m =	4)1217.8	
	N =	304.4	= D♯
	m =	3	
4		913.2	
	B =	1.1	
	n =	2)912.1	
	M =	456.1	= A♯
	n =	3	
5		1368.3	
	B =	1.6	
	m =	4)1366.7	
	N =	341.7	= F
	m =	3	
4		1025.1	
	B =	1.2	
	n =	2)1023.9	
		512.	= C

Mean-Tone Temperament

	3.3	3.6	3.0	4.1	3.3	4.6	2.5	2.5	2.7	4.4	3.0
C	C♯	D	E♭	E	F	F♯	G	G♯	A	B♭	B	C
7		2		4		6	1	8	3		5	
			3		1					2		

	N =	264.0	= C
	m =	3	
4		792.0	
	B =	2.5	
	n =	2)789.5	
	M =	394.8	= G
	n =	3	
5		1184.4	
	B =	3.6	
	m =	4)1180.8	
	N =	295.2	= D
	m =	3	
4		885.6	
	B =	2.7	
	n =	2)882.9	
	M =	441.4	= A
	n =	3	
5		1324.2	
	B =	4.1	
	m =	4)1320.1	
	N =	330.0	= E
	m =	3	
4		990.0	
	B =	3.0	
	n =	2)987.0	
	M =	493.5	= B
	n =	3	
5		1480.5	
	B =	4.6	
	m =	4)1475.9	
	M =	368.9	= F♯
	n =	3	
5		1106.7	
	B =	3.3	
	m =	4)1103.4	
	N =	275.9	= C♯
	m =	3	
4		827.7	
	B =	2.5	
	n =	2)825.2	
		412.6	= G♯

	N =	264.0	= C
	m =	4	
6		1056.0	
	B =	3.3	
	n =	3)1059.3	
	N =	353.1	= F
	m =	4	
6		1412.4	
	B =	4.4	
	n =	3)1416.8	
	M =	472.3	= B♭
	n =	2	
3		944.6	
	B =	3.0	
	m =	3)947.6	
		315.9	= E♭

quired to find the pitch, or number of vibrations, in  .

Tune three true 5ths up and then a true major 6th down ($\frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} \times \frac{3}{5} = \frac{81}{40}$), which will give an imperfect octave above the given note, the ratio being $\frac{81}{40}$ instead of $\frac{2}{1}$; hence $\frac{M}{N} = \frac{81}{40}$ and $\frac{m}{n} = \frac{2}{1}$. Count the beats made by this imperfect octave and suppose them to equal 32 in 10 seconds, or 3.2 per second, then $B = 3.2$; but as $\frac{81}{40}$ is greater than $\frac{2}{1}$ the interval is sharp, so that B is -3.2. Therefore $N = \frac{-3.2}{2-\frac{81}{40}} = 128$. (See Poles, *Philosophy of Music*, p. 315—Fourth Edition.)

CHARACTER OF THE DIFFERENT KEYS

1. There is a noticeable difference in the effect produced by the different keys, which may be described in a general way as follows:

2. The key of C major expresses earnestness, resolution, and decision. Its relative, *a* minor, is tender, melancholy, and plaintive.

3. G major (signature 1 sharp) expresses feeling from quiet and calm to bright and joyous, and is a favorite key. Its relative, *e* minor, is mournful and persuasive.

4. D major (signature 2 sharps) expresses grandeur, triumph, animated feeling, and lofty purpose. Its relative, *b* minor, is very melancholy and bewailing.

5. A major (signature 3 sharps) expresses sincerity, hope, confidence, love, and cheerfulness. Its relative, *f*♯ minor, is dark, mournfully grand, and full of passion.

6. E major (signature 4 sharps) is the most brilliant key, and expresses joy, splendor, and magnificence. Its relative, *c*♯ minor, is the most melancholy key.

7. B, or C♭ major (signature 5 sharps or 7 flats), when loud, expresses pride and boldness; when soft, expresses purity and clearness—not a favorite key. Its relative, *g*♯ or

a♭ minor, has a peculiar, sad, tender pathos, suitable for funeral marches.

8. F major (signature 1 flat) is contemplative and expresses peace, joy, and religious sentiment. Its relative, *d* minor, expresses anxiety, solemnity, and grief.

9. B♭ major (signature 2 flats) is bright and clear, though not specially energetic or grand. Its relative, *g* minor, is sad, dreamy, and romantic.

10. E♭ major (signature 3 flats) is full and soft and capable of a great variety of expression; its general character is serious, solemn, firm, and dignified. Its relative, *c* minor, is soft, earnest, longing, and passionate.

11. A♭ major (signature 4 flats) is sweet, unassuming, delicate, and full of feeling. Its relative, *f* minor, is dismal and gloomy.

12. D♭ major (signature 5 flats) is sublime, deep, and tragic. Its relative, *b*♭ minor, is somber and mournful.

13. G♭ major (signature 6 flats) is very soft and rich. Its relative, *e*♭ minor, is full of melancholy tenderness.

14. The character, however, of a piece of music does not depend wholly on the key, but also on the treatment as regards time, rhythm, etc., so that it is possible in this way to largely counteract the character of the key. But it may be observed that the character of the same piece of music is sensibly altered by a change of key. Therefore the character given to each key only shows the general tendency of each independently of other considerations.

15. These characters cannot be due either to a difference in the intervals or to temperament; for all keys, if equally in tune, regardless of temperament, are composed of the same intervals differing only in pitch. This seems to indicate that the real cause is the difference in pitch. This view is supported by the fact that pitch affects the quality of tone as regards the extent and prominence of the harmonics.

ABBREVIATIONS USED IN MUSIC.

The following is a list of the abbreviations in most common use:

Accel.—Accelerando.
Accom.—Accompaniment.
Adg.—Adagio.
Ad lib.—Ad libitum.
Affett.—Affettuoso.
Affrett.—Affrettando.
Ag.—Agitato.
All.—Allegro.
Allgtt.—Allegretto.
All' 8va—All' ottava.
Al seg.—Al segno.
And.—Andante.
Anim.—Animato.
Arp.—Arpeggio.
A tem.—A tempo.

Brill.—Brillante.

C. B.—Col basso, Contrabbasso.
Cad.—Cadence.
Cal.—Calando.
Cant.—Canto.
Cantab.—Cantabile.
Ch.—Choir organ.
Col. ott.—Coll' ottava.
Col. vo.—Colla voce.
Con esp.—Con espressione.
Cresc.—Crescendo.

D. C.—Da capo.
Decres.—Decrescendo.
Diap.—Diapasons.
Dim.—Diminuendo.
D. Mus.—Doctor of Music.
Dol.—Dolce.
D. S.—Dal Segno.

Esp.—Espressivo.

F.—Forte.
Falset.—Falsetto.
Ff.—Fortissimo.
Fin.—Finale.
F. O.—Full organ.
Forz.—Forzando.
F.p.—Forte-piano.

G. O.—Great organ.
Grand.—Grandioso.

Intro.—Introduction.

L.—Left hand.
Leg.—Legato.
Lo.—Loco.

Maest.—Maestoso.
Magg.—Maggiore.
Marc.—Marcato.
Met.—Metronome.
Mez.—Mezzo.
Mf. or **Mff.**—Mezzo forte.
M. M.—Maelzel's metronome.
Mod.—Moderato.
M. P.—Mezzo piano.
M. V.—Mezza voce.

Obb.—Obbligato.
8va or **8a**—Ottava, Octave.
8va alta—Ottava alta.
8va bas.—Ottava bassa.

P.—Piano, pousse.
Ped.—Pedal.
P. F. or **Pf.**—Piano-forte.
P. f.—Piu forte.
Pianiss.—Pianissimo.
Pizz.—Pizzicato.
PP.—Pianissimo.

4tte—Quartet.

Rall.—Rallentando.
Recit.—Recitative.
R. H.—Right Hand.
Ritar.—Ritardando.

S.—Segno, senza, sinistra, solo, subito.
Scherz.—Scherzando.
Seg.—Segno, segue.
Sf. or **Sfz.**—Sforzando.
Sos.—Sostenuto.
Spir.—Spiritoso.
Stacc.—Staccato.

Tem.—Tempo.
Tr.—Trillo.
Trem.—Tremolando.

U. C.—Una corda.
Unis.—Unison.

V.—Verte, voce, voci, volta, volti.
Var.—Variation.
Viv.—Vivace.

MUSICAL DICTIONARY.

Abbreviations—(F) French; (G) German; (I) Italian; (old E) Old English; (S) Spanish; (L) Latin; (Gk) Greek.

A.

A ballata (I)—In the ballad style.
Abbandono, con (I)—With self-abandonment, passionately.
A battuta (I)—In strict time.
Abendlied (G)—An evening song.
A bene placito (I)—At pleasure.
Ab initio (L)—From the beginning.
A cappella (I)—(1) In the Church style; (2) Church music, duple time.
A capriccio (I)—At will.
Accelerando or **Accelerato** (I)—Gradually increasing the pace.
Acciaccatura (I)—A short grace-note.
Accolade (F)—A brace, uniting several staves.
Achromatic—Not chromatic.
A cinque (I)—In five parts.
Adagietto (I)—A diminutive of Adagio; slower than Adagio.
Adagio (I)—Slowly.
Adagissimo (I)—Very slow indeed.
Addltato (I)—Fingered; having signs to show what fingers are to be used.
Addolorato (I)—In an afflicted manner.
Ad libitum (L)—At will.
Ad placitum (L)—At pleasure.
Affabile (I)—In a pleasing manner.
Affannato (I)—In a distressed manner.
Affanno, con (I)—Mournfully.
Affannoso (I)—Mournfully, with grief.
Affetto, con (I)—With affection.
Affettuoso (I)—Affectionately.
Affezione, con (I)—With tenderness.
Affrettando (I)—Hastening the time.
A flor di labbra (I)—Speaking or singing very softly on the lips.
Agevole (I)—With facility, lightness.
Agilita, con (I)—With sprightliness.
Agilite (F)—Lightness and freedom in playing or singing.
Agitamento (I)—Restlessness.
Agitato (I)—An agitated, restless style.
A la (F), **Al, All', Alla** (I)—Like, in, at, in the style of.
A la meme (F)—In the original time.
A la mesure (F)—In time.
Alla breve (I)—A direction that the notes are to be made shorter.
All' 8va alta (I)—The octave higher.
All 8va bassa (I)—The octave lower.
Allegramente (I)—Joyfully, cheerfully.
Allegretto (I)—Slower than Allegro.
Allegrettino (I)—Not so fast as Allegretto.
Allegrezza (I)—Joy, rejoicing.
Allegrissimo (I)—Extremely quick.
Allegro (I)—Literally, Joyful. Quick, lively. In music it is sometimes qualified as:
Allegro assai (I)—A quicker motion than simple allegro.
Allegro con brio (I)—Quickly and with spirit.
Allegro con fuoco (I)—Rapidly and with fire.
Allegro con moto (I)—With sustained joyfulness.
Allegro con spirito (I)—Joyfully and with spirit.
Allegro di bravura (I)—A movement full of executive difficulties.
Allegro furioso (I)—Rapidly and with fury.
Allegro ma non troppo (I)—Lively, but not too fast.
Allegro moderato (I)—Moderately quick.
Allegro vivace (I)—Lively and brisk.
Allemande (F)—Alemain, Allemaigne, Almain. A dance in duple time.
Allentando (I)—Gradually slackening the time.
All' unisono (I)—In unison or octaves.
Al segno (I)—To the sign.
Alt (I)—The notes in the octave beginning with G above the treble stave are said to be in alt.
Altieramente (I)—Proudly, grandly.
Altissimo (I)—The highest. The notes in the octave beginning with G on the fourth leger line above the treble stave are said to be in altissimo.
Alto clef—The C clef, placed upon the third line of the stave.
A mezza voce (I)—(1) With half the strength of the voice; (2) The quality between the chest and head voice; (3) The subdued tone of instruments.
Amore, con (I)—With love, affection.
Andante (I)—Literally, Walking. Slow, graceful, distinct and peaceful.
—— **cantabile.** Slow, and in a singing style.
—— **con moto.** Faster than Andante, and with animation.
Andantino (I)—Slower than Andante.
Angenehm (G)—Pleasing, agreeable.
Anglaise (F), **Anglico** (I)—The English country dance.

Animato (I)—Animated, lively.
Animoso (I)—Lively, energetic.
Anschwellen (G)—Crescendo.
Antispastus (L)—A foot, consisting of two long between two short syllables.
Antode (Gk)—Responsive singing.
A piacere (I)—(1) At pleasure; not strictly in time, ad libitum; (2) The introduction of a cadenza.
A poco a poco (I)—More and more; by degrees.
A poco piu lento (I)—A little slower.
A poco piu mosso (I)—A little faster.
Apotome (Gk)—A major semitone, B to C.
Appassionato (I)—With feeling.
Appenato (I)—With an expression of suffering; with bitterness or grief.
Appoggiatura (I)—A note leant upon in singing or playing, as a grace note.
A punto (I)—In exact time, precise.
A quatre mains (F), **A quattro mani** (I)—For four hands on one instrument.
Arcato (I)—With the bow, as opposed to pizzicato, plucked with the finger.
Aria (I)—An air, tune, song, melody.
—— **buffa** (I)—A song with some degree of humor in the words, or in the treatment of the music.
—— **d' entrata** (I)—The first or entrance air sung by any character in an opera.
Armarius—Precentor.
Arpeggio (I)—In the style of a harp.
Assai (I)—Very. Allegro assai, very quick.
A tempo (I)—In time.
A tre (I)—For three voices, instruments, or parts.
Attacca (I)—Commence at once, without a pause.
A vista (I)—At sight; used instead of a prima vista, at first sight.

B.

Barcarola (I), **Barcarolle** (F)—A simple melody in imitation of the songs of Venetian gondoliers.
Barre (F)—In guitar or lute playing, the pressing of the forefinger of the left hand across all the strings.
Battere, il (I)—The down-stroke in beating time.
Bellicoso (I)—Warlike, martial.
Ben (I)—Well. Ben marcato, well and clearly marked; ben sostenuto or ben tenuto, well sustained.
Benedictus (L)—Portion of a Mass.
Berceuse (F)—A cradle song.
Bindung (G)—Suspension.
Bis (L)—Twice.
Bolero (S)—A Spanish dance in triple measure, accompanied with singing and castanets.
Bouche fermee, a (F)—With closed mouth; humming.
Bourree (F)—A dance-tune in common time.
Bravour (G), Bravura (I)—Dash, brilliancy.
Breit (G)—Broadly.
Brillante (I and F)—Brilliant.
Brillo (I)—Joy, gladness.
Brio, con (I)—With spirit, vigor.
Brioso (I)—Joyfully, vigorously.
Brise (F)—Broken chords, arpeggios.
Buffa, fem., **Buffo**, mas. (I)—Comic, Aria buffa, a humorous melody; opera buffa, a comic opera.
Burletta (I)—A comic operetta; a farce interspersed with songs.

C.

C clef—The clef showing the position of middle C.
Cabischol, Cabiscola—The precentor in a choir.
Cachucha (S)—A Spanish dance.
Cacophony—Harsh-sounding music
Cadence—A shake or trill, run or division, introduced as an ending, or as a means of return to the first subject.
Cadenz (G)—Cadence.
Cadenza (I)—(1) A passage introduced toward the close of the first or last movement of a concerto; (2) A running passage at the end of a vocal piece.
Calando (I)—With decreasing volume of tone and slackening pace.
Calata (I)—Italian dance in 2-4 time.
Calcando (I)—Hurrying.
Calore, con (I)—With heat, warmth.
Caloroso (I)—Warmly, full of passionate feeling.
Canon—A composition in which the music sung by one part is, after a short rest, sung by another part note for note.
Cantabile (I)—In a singing style..
Cantante (I)—A singer.
Cantata (I)—Originally a mixture of recitative and melody for a single voice, but now a short work in the form of an oratorio.
Canticle—A song or hymn in honor of God, or of some special sacred event.
Canto (I)—The upper voice-part in concerted music.
Cantor—Precentor.

Canzona, Canzone (I)—(1) An old form of song; (2) An instrumental composition in two, three or four parts, containing contrapuntal devices.
Canzonetta (I)—A little short song, tune, cantata, or sonata.
Capischol (L)—Precentor.
Cappella, alla (I)—In the ecclesiastical style; in duple time.
Capo (I)—Head, commencement.
Capriccio (I)—A freak, whim, fancy.
Capriccioso (I)—Whimsical.
Caprice (F)—Capriccio.
Castrato (I)—A male singer with a soprano voice.
Cavatina (I)—A melody of a more simple form than the aria.
Celere (I)— Quick, swift.
Chaconne (F)—A slow dance in ¾ time.
Chanson (F)—(1) A song; (2) A national melody; (3) A part-song.
Chansonnette (F)—A little song.
Chef-d'oeuvre (F)—The master-work of any composer.
Chiave (I)—Key or clef.
Chica—A popular dance among the Spaniards and the South American settlers descended from them.
Chromatic—Notes not belonging to a diatonic scale. A chromatic scale consists of a succession of semitones.
Cinq (F), **Cinque** (I)—A fifth part in concerted music.
Coda (I)—(1) The tail of a note; (2) An adjunct to the ordinary close of a piece or song.
Col, Coll', Colla, Collo (I)—With the.
Coloratura (I)—Divisions, runs, trills, cadenzas, and other florid passages in vocal music.
Comodo (I)—Easily, without haste.
Con (I)—With.
Contra (I)—Against. In compound words this signifies an octave below, as Contra-gamba, a 16-ft. gamba.
Contrappunto (I)—Counterpoint.
Contrapunkt (G)—Counterpoint.
Contrapuntal—Belonging to counterpoint.
Contra tempo (I)—Against time. (1) The part progressing slowly while another is moving rapidly; (2) Syncopation.
Contrepartie (F)—Counterpart, opposite. The entry of a second voice with a different melody.
Contretemps (F)—Against time.
Coranto (I)—An Italian form of the country dance; a running dance.
Counterpoint—"The art of adding one or more parts to a given melody."
Couplet—(1) A verse of a song; (2) Two notes occupying the time of three.
Crescendo (I)—Increasing; a gradual increase in the force of sound.
Crotchet—A quarter note, one-fourth of the value of a semibreve.

D.

Da (I)—From, by, of, for, etc.
Da capo, or **D. C.** (I)—From the beginning.
Da capo al fine (I)—From the beginning to the sign Fine.
—— al segno (I)—Repeat from the beginning to the sign S.
Dal segno (I)—From the sign S.
Decrescendo (I)—Decreasing gradually the volume of tone.
Decuplet—A group of ten notes played in the time of eight or four.
Diatonic—One of the three genera of music among the Greeks, the other two being the chromatic and enharmonic.
Diminuendo (I)—Decreasing in power of sound.
Ditone—An interval of two major tones.
Divertimento (I)—(1) An instrumental composition of a light, pleasing character; (2) Pot-pourri.
Dolce (I)—Softly, sweetly.
Dolente, Doloroso (I)—In a plaintive, sorrowful style; with sadness.
Dominant—The fifth degree of a scale.
Droite (F)—Right; as main droite, the right hand.
Duple time—Even time.

E.

Echelle (F)—A scale; as, échelle chromatique, chromatic scale; échelle diatonique, diatonic scale.
Eclogue (F)—A shepherd's song; a pastoral piece.
Eiferig (G)—Zealously, ardently.
Einfalt (G)—With simplicity and dignity.
Einigem Pomp, mit (G)—In a somewhat pompous manner.
Einschlafen (G)—To slacken pace and diminish the power.
Ein wenig lebendig (G)—Rather lively.
Elegant (F), **Elegante** (I)—With elegance of style.
Emozione, con (I)—With emotion.
Empfindung (G)—Emotion, passion.
En badinant (F)—Scherzando.
Energia, Energico (I)—With energy.
Enfler (F)—To swell; to increase in sound.
Ensemble (F)—Together; the whole. The general effect of a musical performance.

Entr'acte (F)—Music played between the acts of an opera, drama, etc.
Entrante (I), **Entree** (F)—Entry, introduction, or prelude.
Entusiasmo (I)—With enthusiasm.
Entwurf (G)—A sketch.
Epicedion (Gk)—A dirge; elegy.
Epilenia (Gk)—Vintage songs.
Epithalamium (Gk)—A nuptial song.
Epode (Gk)—An after-song.
Erhaben (G)—Exalted, sublime.
Ernstlich (G)—Earnestly, fervently.
Erotique (F)—A love-song.
Espagnuolo (I)—In the Spanish style.
Espressivo (I)—Expressive.
Estinguendo (I)—Dying away, gradually reducing both power and pace.
Etude (F)—A study, exercise, lesson.
Eveille (F)—Sprightly, quick, lively.

F.

F clef—The bass clef.
Facile (F)—Easy.
Falsetto (I)—The artificial or supplementing tones of the voice, higher than the chest or natural voice.
Fandango (S)—A lively Spanish dance in triple time.
Fantasia (I), **Fantaisie** (F), **Fantasie** (G)—A composition in which form is subservient to fancy.
Farandola (I), **Farandoule** (F)—An exciting dance, popular among the peasants in the south of France and the neighboring part of Italy.
Fausset (F)—Falsetto.
Feldmusik (G)—Military music.
Fermamente (I)—Firmly, with decision.
Fermata (I)—A pause.
Feroce (I)—Wildly, fiercely.
Fertig (G)—Quick, dexterous.
Fervore, con (I)—With fervor.
Fest (G)—(1) A festival; (2) Firm.
Festivo (I)—Festive, solemn.
Festoso (I)—Joyous, gay.
Feuer (G)—Fire, ardor, warmth.
Fiacco (I)—Weak, weary, faint.
Fieramente (I)—Proudly, fiercely.
Figured bass—A bass having the accompanying chords suggested by certain numbers.
Filer le son (F)—To prolong a sound.
Fin (F)—The end.
Finale (I)—The last movement of a concerted piece, sonata, or symphony; the last piece of an act of an opera, or in a program.
Fine (I)—The end.
Flebile (I)—In a mournful manner.
Fliessend (G)—Fluently, softly.
Fluechtig (G)—Light, rapid.
Foco (I)—Fire, spirit.
Fort (F), **Forte** (I)—Loud.
Fortissimo (I)—Very loud.
Fortissisimo (I)—As loud as possible.
Forza, con (I)—With emphasis.
Forzando (I)—Forcing. Emphasis or musical accent upon specified notes or passages.
Francaise (F)—A dance in a triple measure.
Fretta, con (I)—With speed, haste.
Frisch (G)—Lively.
Froehlich (G)—Joyous, cheerful, gay.
Fuge (G)—A fugue.
Fugue—A polyphonic composition constructed on one or more short subjects or themes.
Funebre (F)—Funereal, mournful.
Fuoco, con (I)—With fire, energy.

G.

G clef—The treble clef.
Gai (F), **Gajo** (I)—Lively, merry, gay.
Gamut—The scale.
Gauche (F)—Left.
Gavotte (F), **Gavotta** (I)—A dance-tune of a lively yet dignified character.
Gedackt (G)—Covered or closed.
Gefuehl, mit (G)—With feeling, expression.
Gekneipt (G)—Pizzicato.
Gesang (G)—Singing, song, cantata, hymn, etc.
Geschwind (G)—Quick, rapid.
Gestossen (G)—Staccato.
Getragen (G)—Sustained.
Gioco, con (I)—Sportively, playfully.
Giusto (I)—Strict, correct, moderate.
Glaenzend (G)—Brilliant.
Glissando (I)—(1) Sliding the tips of the fingers along the keys of the piano; (2) A rapid slur in violin-playing.
Glockenspiel (G)—(1) An instrument made of bells tuned diatonically and struck with hammers; (2) An organ stop of two ranks.
Graduale (L)—A piece of music performed between the reading of the Epistle and Gospel in the Roman Church.
Grandioso (I)—In a lofty manner.
Grave (L., I., F., E.)—(1) Deep in pitch; (2) Slow in pace, solemnly.
Gravemente (I)—With dignity, gravity, earnestness.
Grazioso (I)—Gracefully, elegantly.
Gregorian—Plain-song.
Gruppetto (I)—Notes grouped as a cadenza, division, or ornament.
Guaracha (S)—A lively Spanish dance.
Gusto, con (I)—With taste and expression.

H.

Halling—A Norwegian dance.
Hochzeitmarsch (G)—Wedding march.
Hosanna—(1) An exclamation, "Save, I pray," formed from Ps. 118: 25; (2) Part of the Sanctus in the Mass.
Hurtig (G)—Nimble, quick, agile.

I.

Iambic—Having a short and a long syllable alternately.
Il fine (I)—The end.
Imperioso (I)—With grandeur, dignity, imperiously.
Impeto, con (I)—Impetuously.
Impresario (I)—A designer, conductor or manager of a concert or opera party.
Impromptu (I)—(1) Music written or played without previous preparation; (2) A piece in the style of an improvisation.
In alt (I)—All notes in the first octave beyond the range of the treble stave.
In altissimo (I)—All notes beyond the range of the first octave in alt.
Intermezzo (I)—An interlude.
Intonation—(1) The method of producing sound from a voice or an instrument; (2) Singing or playing in perfect tune; (3) The method of chanting certain portions of the Church services.
Intrada (I)—An interlude or entr'acte.
Introit—An antiphon sung while the priest proceeds to the altar to celebrate Mass.
Ite missa est (L)—The concluding words of the Mass in the Romish Church.

J.

Jaleo—A national dance of Spain.
Jodle—A peculiar method of singing adopted by the Swiss and Tyrolese.
Jota—A Spanish dance.

K.

Kalamaika—A Hungarian dance.
Kapelle (G)—A word formerly applied to a private band, but now used to denote any band.
Kapellmeister (G)—The leader or conductor of a band of music.
Kirche (G)—Church.
Klagend (G)—Mournfully, plaintively.
Kraeftig (G)—Energetically.
Kreol (D)—A dance similar to the reel.
Kreuz (G)—The sign for a sharp.
Kriegslied (G)—A battle-song.
Kunstpfeifer (G)—Town musician.

L.

L—The letter employed as the abbreviation of the word left or linke (G).
La destra (I)—The right hand.
Lacrimoso (I)—Mournfully.
Lai (F)—A lay, song.
Largamente (I)—Slowly, widely, freely.
Larghetto (I)—At a slow pace, but not so slow as largo.
Larghissimo (I)—Exceedingly slow.
Largo (I)—Slow, broadly.
Laut (G)—Loud, forte; sound.
Lebendig (G)—Lively.
Lebhaft (G)—Lively.
Lebhaftesten (G)—With extreme liveliness.
Legando (I)—Tied, connected.
Legatissimo (I)—Exceedingly smooth.
Legato (I)—Bound, close, connected.
Legatura (I)—A bind, brace, or tie.
Leggiere (I)—Very lightly, rapidly.
Leggiermente (I)—With lightness.
Leicht (G)—Easy, light.
Leidenschaftlich (G)—Passionately.
Leise (G)—Softly, lightly.
Leitmotiv (G)—A theme constantly recurring in association with a particular person or action throughout an opera.
Lent (F)—Slow.
Lentando (I)—Becoming slower by degrees; slackening the time.
Lento (I)—Slow.
Lesto (I)—Light, lively, cheerful, gay.
Libretto—The book containing the words of an oratorio, opera, etc.
Lied (G)—A composition of a simple character, which is complete in itself; a song.
Liederbuch (G)—Song-book.
Liederspiel (G)—A play with songs of a popular character introduced into it.
Liedertafel (G)—Literally, Song-table. A society meeting for the practice of part-songs for men's voices.
Linke Hand (G)—Left hand.
Lire (F)—A lyre or harp.
Loco (I)—In its proper place. A direction to return to the proper pitch after having played an octave higher.
Loure or **Louvre** (F)—A dance.
Lustig (G)—Merry, merrily.
Lyre—One of the most ancient stringed instruments.

M.

M—Abbreviation of mezzo, mano, main, manual.

Madrigal—A word of doubtful origin. It became a general term for secular compositions, of which there were various forms differing in style.

Maestoso (I)—With dignity, majesty.

Maestro (I)—Master.

Maggiolata (I)—A song sung in celebration of the month of May.

Main (F)—The hand.

Maitre de chapelle (F)—Choirmaster.

Malinconico (I)—With sadness, sorrow.

Maniere (F)—As maniera affettata, an affected style; maniera languida, a languid, lifeless style.

Maennerstimmen (G)—Men's voices.

Mano (I)—Hand.

Marziale (I)—In a martial style.

Mazurka—A Polish dance of lively, grotesque character

Meistersinger (G)—A title given to the most renowned musician of a township or district in Germany during the Middle Ages.

Melange (F)—A medley.

Meno (I)—Less.

Mestoso (I)—Sad, pensive.

Mezzo (I)—Half or medium.

Minuet—The name of a graceful dance in triple time.

Miserere—The 51st Psalm sung in the Tenebræ service in the Roman Catholic Church.

Mit (G)—With.

Moderato (I)—Moderately.

Moll (G)—Minor.

Molto (I)—Much, very.

Monotone, to—To recite words on a single note without inflections.

Morceau (F)—A piece; a small composition of an unpretending character.

Mordente (I)—A beat, or turn, or passing shake.

Morgenlied (G)—Morning song.

Mosso (I)—Moved.

Motet—A vocal composition in harmony, now generally set to sacred words.

Motiv (G)—(1) The sort of movement indicated by the opening notes of a sentence; (2) A subject proposed for development.

Munter (G)—Lively.

Musette (F)—(1) A small bagpipe; (2) A melody of a soft, sweet character, written in imitation of the bagpipe-tunes; (3) Dance-tunes and dances in the measure of those melodies; (4) A reed-stop on the organ.

Muthig (G)—With spirit.

N.

Nach Belieben (G)—Ad libitum.

Nachspiel (G)—A postlude.

Nachtstuecke (G)—Night-visions. The name of four pianoforte pieces by R. Schumann.

Nach und nach (G)—By little and little, by degrees.

Naivement (F)—Artlessly, unaffectedly.

Nobilmente (I)—With grandeur, nobly.

Noel (F)—"Good news." A word used as a burden to carols at Christmas.

Non (I)—Not.

Notturno (I)—Originally, a kind of serenade; now a piece of music of a gentle and quiet character.

Nuances (F)—Shades of musical expression.

O.

Obbligato (I)—An instrumental part or accompaniment of such importance that it cannot be dispensed with.

Offertoire (F), **Offertory**—A piece of music performed during the offertory.

Opera (I)—A dramatic entertainment of Italian origin in which music forms an essential part.

Opus (L)—A work.

Oratorio (I)—A composition for voices and instruments illustrating some sacred subject.

Overture—An instrumental piece written as a prelude to an opera, oratorio, or other work.

P.

Paean (Gk)—The ancient choral song addressed to Apollo. Sung before or after a battle.

Part-song—A vocal composition, having a striking melody harmonized by other parts

Passionato (I)—In an impassioned manner.

Pastoral, Pastorale (I)—(1) A simple melody in 6-8 time in a rustic style; (2) A cantata, the words of which are founded on pastoral incidents; (3) A complete symphony, wherein a series of pastoral scenes is depicted by sound-painting, without the aid of words.

Patetico (I), **Pathetique** (F)—(1) Pathetic; (2) In a pathetic manner.
Pentatonic scale—The name given to the ancient musical scale, which is easiest described as that formed by the black keys of the pianoforte.
Petit choeur (F)—The chorus which originally consisted of three parts only.
Peu a peu (F)—Little by little.
Phrasing—The proper rendering of music with reference to its melodic form.
Piacere, a (I)—At pleasure.
Pianissimo (I)—Extremely soft.
Pianississimo (I)—As softly as possible.
Piano (I)—Softly.
Piu (I)—More.
Pizzicato (I)—A direction to violinists to produce the tone by plucking the string with the finger.
Plagal cadence—The cadence formed when a subdominant chord immediately precedes the final tonic chord.
Poco (I)—A little.
Poi (I)—Then.
Polacca (I)—Polish. A title applied to melodies written in imitation of Polish dance-tunes.
Polka—A Bohemian dance of world-wide popularity, in 2-4 time.
Pomposo (I)—Pomposnly.
Portamento (I)—A lifting of the voice, or gliding from one note to another.
Postlude—A concluding voluntary; a piece played at the end of service.
Pot-pourri (F)—A medley; a collection of various tunes linked together.
Pralltriller (G)—A transient shake.
Precentor—An official in a cathedral who leads and directs the choir, etc.
Precipitato (I)—With precipitation.
Preciso (I)—With exactitude.
Prelude—A movement played before, or an introduction to, a musical work or performance.
Premiere (F)—First.
Prestissimo (I)—Very fast indeed.
Presto (I)—Fast.
Prima (I. fem.)—First.
Primo (I, masc.)—First.
Proscenium—(1) The quadrangular space behind the logeum or stage; (2) The stage front.
Provencales — Troubadours of Provence.
Psalter—A book of Psalms.

Q.

Quadrille—A well-known dance, consisting of five movements.
Quasi (I)—As if, or in the style of.

R.

Raddolcendo (I)—With gradual softness and sweetness.
Rallentamento (I)—At a slower pace.
Rallentando (I)—Getting gradually slower.
Rapidita, con (I)—With rapidity.
Recitative—Musical declamation; a kind of half-speaking and half-singing; a composition without any decided or rhythmical melody.
Reel (old E)—A lively rustic dance, popularly supposed to be Scotch, but probably of Scandinavian origin.
Reveil (old E)—Music which wakens from sleep. A signal given by drum to soldiers at dawn.
Rhapsodie (G), **Rhapsody**—A composition of irregular form, and in the style of an improvisation.
Rhythm—The arrangement of musical phrases or sentences in regular metrical form, as regards accent and quantity.
Rigore (I)—Strictness.
Risoluto (I)—With resolution.
Ritardando (I)—With gradually increasing slowness of pace.
Ritenuto (I)—Holding back the pace.
Robusto (I)—Robust, strong, powerful.
Role (F)—The part in a drama assigned to an actor.
Romance (F, S), **Romanza** (I)—Any simple rhythmical melody which is suggestive of a romance.
Romanesca (I)—An Italian dance.
Romera—A Turkish dance.
Rondeau (F), **Rondo** (I)—A composition generally in two parts, with the principal subject often repeated.
Roulade (F)—An embellishment; a flourish.
Round—A composition in which several voices, starting at stated distances of time from each other, sing each the same music, the combination of all the parts producing correct harmony.
Roundel—A rustic song; a dance in which all join hands in a ring.
Roundelay—(1) A poem, certain lines of which are repeated at intervals; (2) The tune to which a roundelay was sung.

S.

Salto (I)—(1) A dance in which there is much leaping and skipping; (2) A leap or skip from one note to another beyond the octave; (3) Counterpoint in which the part added moves in skips.
Sans (F)—Without.
Saraband, Sarabanda (I), **Sarabande** (F)—A Spanish dance of Moorish origin, for a single performer, accompanied with castanets.
Satz (G)—A theme, subject, composition, piece, movement.
Scherzando (I)—(1) Playful, lively; (2) A movement of a droll character.
Scherzo (I)—Literally, a jest, applied to a movement in a sonata or symphony, of a sportive character.
Schlummerlied (G)—A slumber-song.
Schluss (G)—The conclusion; finale.
Schlussstueck (G)—Finale.
Schmelzend (G)—Literally, Melting away. Dying away; diminishing.
Schnell (G)—Quick.
Schottische (G)—Literally, The Scotch dance. A slow dance of modern introduction, in 2-4 time.
Score—A copy of a musical work in which all the component parts are shown either fully or in a compressed form.
Sdegno, con (I)—Scornfully; disdainfully.
Sec (F)—Dry, unadorned, plain.
Secondo (I)—Second.
Segno (I)—The sign S.
Segue (I)—Follows, succeeds.
Seguidilla (S)—A lively Spanish dance, similar to the country-dance.
Semplice (I)—Pure, plain, simple.
Sempre (I)—Always, ever.
Senza (I)—Without.
Sequence—The recurrence of a harmonic progression or melodic figure at a different pitch or in a different key to that in which it was first given.
Serenade—(1) Originally a composition for use in the open air at night, generally of a quiet, soothing character; (2) A work of large proportions in the form of a symphony.
Sestetto (I)—A composition for six voices or instruments.
Sforzando (I)—Forced.
Siciliana (I)—A graceful dance of the Sicilian peasantry.
Siegeslied (G)—A song of triumph.
Silhouettes (F)—Sketches; recollections.
Singspiel (G)—Opera.
Slargando (I)—Widening, opening.
Slentando (I)—Slackening the time.
Soave (I)—Agreeably, delicately.
Soggetto (I)—Subject, theme, motive.
Solennel, le (F)—Solemn.
Sol-faing—A vocal exercise in which the notes are called by the several names Do, Re, Mi, Fa, Sol, La, Ti.
Sonata—A composition consisting of three or four movements, generally for a solo instrument, and in symphonic form.
Sonatina (I), **Sonatine** (F)—A short sonata.
Sopra (I)—Above, before, over, upon.
Sorda, Sordo (I)—Muffled with a mute.
Sortie (F)—A voluntary played at the close of a service.
Sostenuto (I)—Sustaining.
Sotto (I)—Below, under.
Sous (F)—Under.
Spianato (I)—Smooth, level, even.
Spirito, con (I)—In a spirited, lively, animated, brisk manner.
Staccato (I)—Detached, taken off.
Stanza (I)—A verse or subdivision of a poem; a strophe.
Stentato (I)—Forced, emphasized.
Stimme (G)—(1) The voice; (2) Sound; (3) The sound-post of a violin or violoncello; (4) A part in vocal or instrumental music; (5) An organ-stop or rank of pipes.
Strepitoso (I)—Noisy, impetuous.
Stringendo (I)—Pressing, hastening on the time.
Stueck (G)—A piece, air, composition.
Suave (I)—Sweet, agreeable, pleasant.
Sub (L)—Under.
Sub-bass—A pedal register in the organ, of 32-ft. tone.
Subdominant—The fifth below or the fourth above any key-note.
Suite (F)—A set, series, or succession of movements in music.
Super (L)—Above, over.
Suess (G)—Sweet.
Symphony—(1) A composition for an orchestra, similar in construction to the sonata, which is usually for a single instrument; (2) Formerly overtures were called symphonies; (3) The introductory, intermediate and concluding instrumental parts of a song or other vocal piece are also called symphonies.
Syncopation—Suspension or alteration of rhythm by driving the accent to that part of a bar not usually accented.

T.

Takt (G)—Time, measure, bar.
Tanto (I)—So much; as much.
Tarantella (I)—A rapid Neapolitan dance in triplets, so called because it was thought to be a remedy against the supposed poisonous bite of the tarantula spider.
Tardamente (I)—Slowly.
Tardo (I)—Slow, dragging.

Technik (G)—A general name for the systems, devices and resources of musical art.
Tema (I)—A theme or subject; a melody.
Tempo (I)—Time or measure.
Temps (F)—Time; the parts or divisions of a bar.
Tenu (F), **Tenuto** (I)—Held on; sustained; kept down for the full time.
Terzetto (I)—A composition for three performers.
Tetrachord—A scale-series of four notes. The word in its modern sense signifies a half of the octave scale.
Thesis (Gk)—(1) In metre, the heavy tone or vocal accent; (2) In rhythm, the non-accent, or up-beat.
Threnody (Gk)—An elegy, or funeral song.
Tie—(1) A curved line placed over two or more notes in the same position on the stave, to show they are to be played as one; (2) When two or more quavers, semiquavers, etc., are united, instead of being written with separate tails, they are said to be tied.
Timbre (F)—Quality of tone or sound.
Timoroso (I)—Timorous; with hesitation.
Toccata (I)—(1) A prelude or overture; (2) Compositions written as exercises; (3) A fantasia; (4) A suite.
Tonfuehrung (G)—(1) A melodic succession; (2) Modulation.
Tonic, Tonico (I), **Tonique** (F)—(1) The key-note of any scale; the groundtone or basis of a scale or key; (2) The key-chord in which a piece is written.
Tonkuenstler (G)—A musician; a musical artist.
Tremolo (I)—Trembling.
Tranquillo (I)—Tranquilly, calmly.
Tres (F)—Very.
Troppo (I)—Too much.
Tutti (I)—All. Every performer to take part in the execution of the passage or movement.
Tyrolienne—(1) A song accompanied with dancing; (2) Popular songs or melodies in which the jodle (q. v.) is freely used.

U.

Uebelklang (G) — Discord, cacophony.
Un (I)—One.
Un poco (I)—A little.

V.

Va (I)—Go on.
Vaudeville (F)—A play with songs set to popular tunes.
Veloce (I)—Rapid, swift.
Versette (G)—Short pieces for the organ intended as preludes or voluntaries.
Verte (L)—Turn over.
Vibrante (I)—Vibrating, tremulous.
Viel (G)—Much.
Viergesang (G)—Song for four parts.
Vierhaendig (G)—For four hands.
Vif (F)—Lively, brisk, quick.
Vigoroso (I)—Vigorous, bold, forcible.
Vistamente (I)—Briskly, quickly.
Vivace (I)—Lively, quickly, sprightly.
Vivacissimo (I)—Very lively.
Vivamente (I), **Vivement** (F)—Lively.
Voce (I), **Voix** (F), **Vox** (L)—The voice.
Volante (I)—Flying. Applied to the execution of a rapid series of notes, either in singing or playing.
Volkslied (G)—A popular song.
Voluntary—An organ solo played before, during or after any office of the Church; hence, called respectively introductory, middle or concluding voluntary.
Vorsaenger (G)—Precentor.
Vorspiel (G)—Prelude; overture.

W.

Wechselgesang (G)—Responsive or antiphonal song.
Wehmuth (G)—Sadness, sorrow.
Wiegenlied (G)—A lullaby; a cradle-song.
Wuerde, mit (G))—With dignity.

Z.

Zaleo—A Spanish national dance.
Zaertlich (G)—Softly, delicately.
Zeichen (G)—A musical sign, note, or character.
Zeloso (I)—Zealous, energetic.
Ziemlich (G)—Moderately.
Zurueckhaltung (G)—Retardation.

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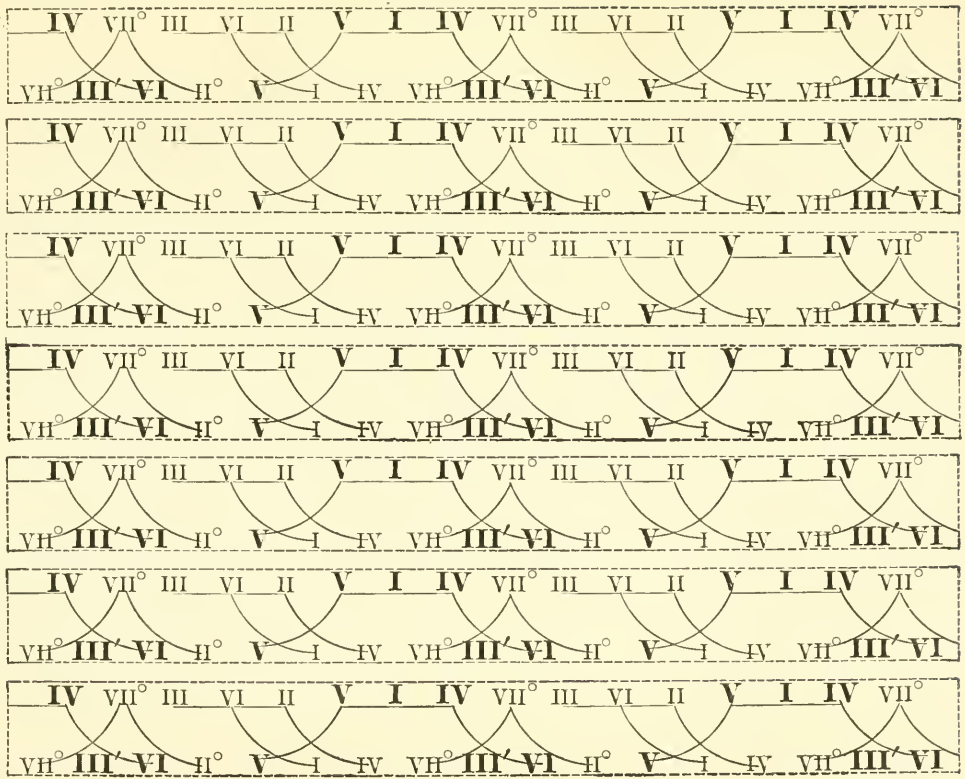

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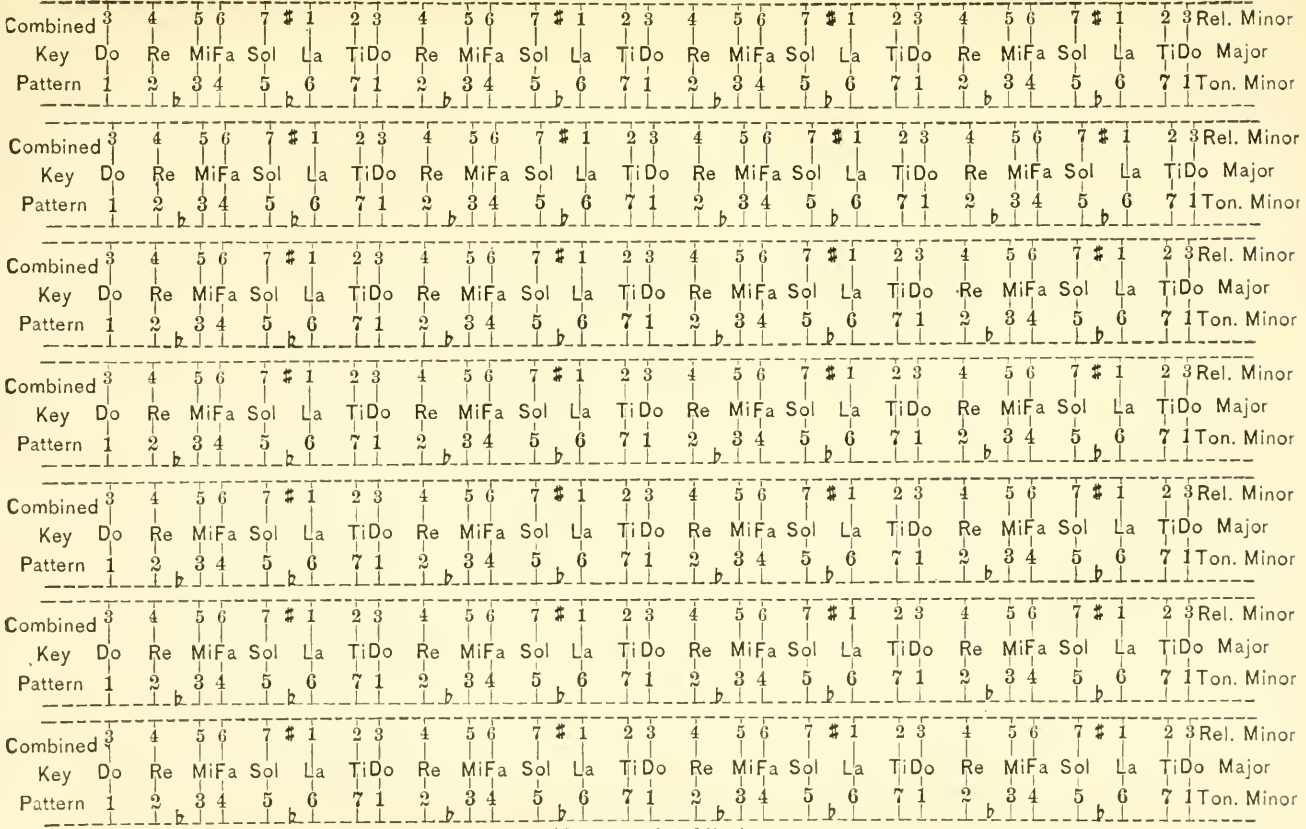

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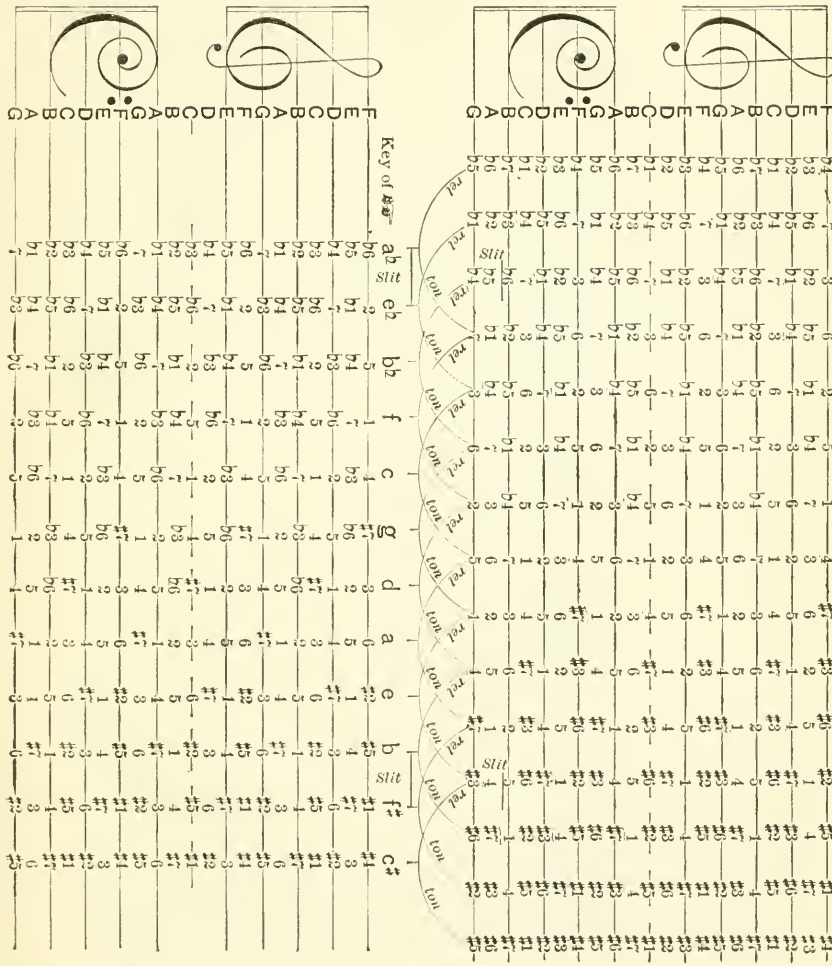
(*Page 231*)

COMBINED MAJOR AND MINOR KEY TABLE.



(See page 97: 20, 21)

Place combination triad formula (cut from page 229) on the curved lines between the major and minor key tables and hold in place by clips as in Chart 1 (see slit marks).

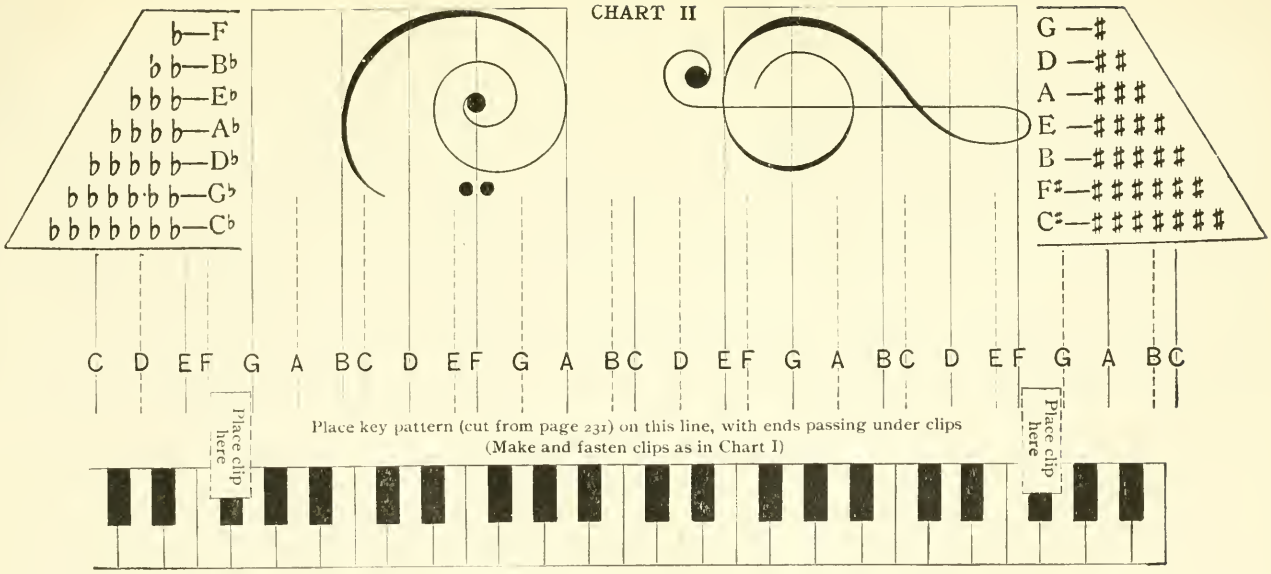


CHART II
♭—F
♭♭—B♭
♭♭♭—E♭
♭♭♭♭—A♭
♭♭♭♭♭—D♭
♭♭♭♭♭♭—G♭
♭♭♭♭♭♭♭—C♭
G —♯
D —♯♯
A —♯♯♯
E —♯♯♯♯
B —♯♯♯♯♯
F♯—♯♯♯♯♯♯
C♯—♯♯♯♯♯♯♯
C D E F G A B C D E F G A B C D E F G A B C D E F G A B C
Place clip here
Place clip here
Place key pattern (cut from page 231) on this line, with ends passing under clips
(Make and fasten clips as in Chart I)

(The major or minor pattern used in Chart I may also be used with this chart)

The Combined Key Pattern (cut from page 231) may be enlarged to correspond to the piano or organ keyboard, then pasted on a strip of cardboard, or a smooth slat, and set over the black keys of the keyboard. In thus enlarging the pattern, first measure off the octave to exactly correspond to the octave on the keyboard, then divide each octave into 12 equal parts, then draw the lines through the points corresponding to the diatonic intervals.

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